Project Manual

Request for Proposal

Event # 625

Guilford County Law Enforcement Center

401 W. Sycamore Street

Greensboro, NC 27401

Guilford County
Law Enforcement Center Renovation

for:

County of Guilford , North Carolina
Facilities, Property Management and Parks Department
Greensboro, NC

June 26, 2018

Project No. 17-496
Walter Robbs Callahan & Pierce Architects, PA

Prepared for:

GUILFORD COUNTY FACILITIES AND PARKS
Purchasing Director
Old County Courthouse
301 W. Market Street, Room B32
Greensboro, NC 27401
336.641.3314

PROJECT MANUAL SEALS PAGE

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WRCP PROJECT NO. 17-496

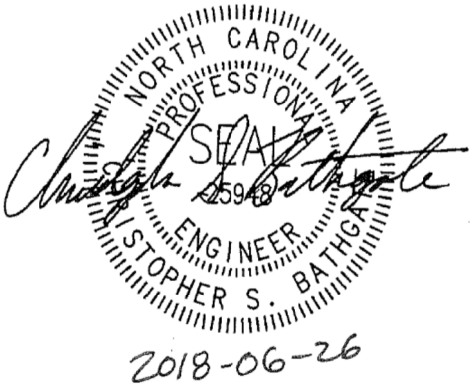
June 26, 2018

Corporate Seal
Walter Robbs Callahan & Pierce Architects, PA

Architectural
Walter Robbs Callahan & Pierce Architects, PA

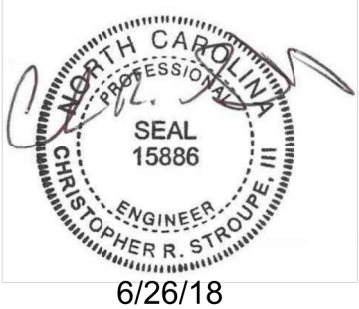
6/26/18

Structural Engineering
SKA Consulting Engineers, Inc



2018-06-26

PME/Fire Protection Engineer
Consultant Engineering Service, Inc.



6/26/18

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(WRCP) = Walter Robbs Callahan & Pierce
(SKA) = SKA Consulting Engineers, Inc
(CES) = Consultant Engineering Service, Inc

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PD6.1 PLUMBING SEWER & WATER DEMO LEVEL 8
PD7.1 PLUMBING ROOF DEMO
P0.1 PLUMBING SEWER PLAN LEVEL 0
P0.2 PLUMBING WATER PLAN LEVEL 0
P1.1 PLUMBING SEWER PLAN LEVEL 1
P1.2 PLUMBING WATER PLAN LEVEL 1
P2.1 PLUMBING SEWER PLAN LEVEL 2
P2.2 PLUMBING WATER PLAN LEVEL 2
P3.1 PLUMBING SEWER & WATER PLAN LEVEL 3
P4.1 PLUMBING SEWER & WATER PLAN LEVEL 4
P5.1 PLUMBING SEWER & WATER PLAN LEVEL 5
P6.1 PLUMBING SEWER & WATER PLAN LEVEL 6
P7.1 PLUMBING SEWER & WATER PLAN LEVEL 7
P8.1 PLUMBING SEWER & WATER PLAN LEVEL 8
P9.1 PLUMBING ROOF PLAN
P10.1 PLUMBING RISERS
P10.2 PLUMBING RAINWATER RISERS
P10.3 RAINWATER RISERS
P10.4 CONDENSATE RISERS
P11.1 PLUMBING DETAILS
P12.1 PLUMBING SCHEDULES

MECHANICAL
M0.0.01 MECHANICAL COVER
MD0.01 MECHANICAL LEVEL 0 DEMO
MD1.01 MECHANICAL LEVEL 1 DEMO
MD2.01 MECHANICAL LEVEL 2 DEMO

MD3.01 MECHANICAL LEVEL 3 THRU 6 DEMO
MD4.01 MECHANICAL LEVEL 7 & 8 DEMO
MD5.01 MECHANICAL HIGH ROOF DEMO
M0.01 MECHANICAL LEVEL 0
M1.01 MECHANICAL LEVEL 1 DUCTWORK
M1.02 MECHANICAL LEVEL 1 PIPING
M2.01 MECHANICAL LEVEL 2 LOW ROOF
M2.02 MECHANICAL ROOM
M2.03 MECHANICAL ROOM ISOMETRIC
M3.01 MECHANICAL LEVEL 3 & 4 ALTERNATE 1
M3.02 MECHANICAL LEVEL 3 & 4
M4.01 MECHANICAL LEVEL 5 & 6 ALTERNATE 1
M4.02 MECHANICAL LEVEL 5 & 6
M5.01 MECHANICAL LEVEL 7 & 8
M6.01 MECHANICAL HIGH ROOF PLAN
M7.01 MECHANICAL DETAILS
M7.02 MECHANICAL DETAILS
M7.03 MECHANICAL DETAILS
M7.04 MECHANICAL DETAILS
M7.05 MECHANICAL UL DETAILS
M8.01 MECHANICAL SCHEDULES
M8.02 MECHANICAL SCHEDULES

ELECTRICAL

E0.00 ELECTRICAL COVER SHEET
ED0.01 ELECTRICAL POWER LEVEL 0 DEMO
ED0.02 ELECTRICAL LIGHTING LEVEL 0 DEMO
ED1.01 ELECTRICAL POWER LEVEL 1 DEMO
ED1.02 ELECTRICAL LIGHTING LEVEL 1 DEMO
ED2.01 ELECTRICAL POWER LEVEL 2 DEMO
ED2.02 ELECTRICAL LIGHTING LEVEL 2 DEMO
ED3.01 ELECTRICAL POWER & LIGHING LEVEL 3 DEMO
ED4.01 ELECTRICAL POWER & LIGHING LEVEL 4, 5, & 6 DEMO
ED5.01 ELECTRICAL POWER & LIGHING LEVEL 7 DEMO
ED6.01 ELECTRICAL POWER & LIGHING LEVEL 8 DEMO
ED7.01 ELECTRICAL POWER & LIGHING LEVEL ROOF DEMO
ED8.01 ELECTRICAL POWER & LIGHTING LEVEL PH DEMO
ED9.01 ELECTRICAL POWER RISER DEMO
ED9.02 ELECTRICAL TEL/COMM RISER DEMO
E0.01 ELECTRICAL POWER LEVEL 0
E0.02 ELECTRICAL LIGHTING LEVEL 0
E1.01 ELECTRICAL POWER LEVEL 1
E1.02 ELECTRICAL LIGHTING LEVEL 1

E2.01	ELECTRICAL POWER LEVEL 2
E2.02	ELECTRICAL LIGHTING LEVEL 2
E3.01	ELECTRICAL POWER & LIGHTING LEVEL 3
E3.01A	ELECTRICAL POWER & LIGHTING LEVEL 3 ALTERNATE 1
E4.01	ELECTRICAL POWER & LIGHTING LEVEL 4
E4.01A	ELECTRICAL POWER & LIGHTING LEVEL 4 ALTERNATE 1
E5.01	ELECTRICAL POWER & LIGHTING LEVEL 5
E5.01A	ELECTRICAL POWER & LIGHTING LEVEL 5 ALTERNATE 1
E6.01	ELECTRICAL POWER & LIGHTING LEVEL 6
E7.01	ELECTRICAL POWER & LIGHTING LEVEL 7
E8.01	ELECTRICAL POWER & LIGHTING LEVEL 8
E9.01	ELECTRICAL POWER & LIGHTING LEVEL ROOF
E10.01	ELECTRICAL POWER & LIGHTING LEVEL PH
E11.01	ELECTRICAL POWER RISER
E11.02	ELECTRICAL TEL/COMM RISER
E12.01	ELECTRICAL POWER DETAIL
E12.02	ELECTRICAL POWER DETAIL
E12.03	ELECTRICAL POWER DETAIL
E13.01	ELECTRICAL PANEL SCHEDULE
E13.02	ELECTRICAL PANEL SCHEDULE
E13.03	ELECTRICAL PANEL SCHEDULE
E13.04	ELECTRICAL PANEL & LIGHT SCHEDULE
E14.01	FIRE ALARM LEVEL 0
E14.02	FIRE ALARM LEVEL 1
E14.03	FIRE ALARM LEVEL 2
E14.04	FIRE ALARM LEVEL 3 & 4
E14.04A	FIRE ALARM LEVEL 3 & 4 ALTERNATE 1
E14.05	FIRE ALARM LEVEL 5 & 6
E14.05A	FIRE ALARM LEVEL 5 ALTERNATE 1
E14.06	FIRE ALARM LEVEL 7 & 8
E14.07	FIRE ALARM LEVEL ROOF & PENTHOUSE
E15.01	FIRE ALARM DETAIL
E15.02	FIRE ALARM DETAIL

END OF CONTENTS 00010

DOCUMENT 00100 – INVITATION TO BID

Guilford County Facilities is seeking Proposals from individuals or firms interested in providing services for the renovation of the existing Guilford County Law Enforcement Center (Old Jail) at 401 W. Sycamore Street, Greensboro, NC 27401. The renovated building will be converted into office space for the Sheriff's administration operation and other law enforcement offices.

The building was constructed in 1974 consists of approximately 113,400 sf and is a multi-story (9 levels) building. The exterior facade is precast concrete panels and cast-in-place concrete. Existing structure is cast-in-place concrete throughout except portions of the lower two levels which consist of structural steel. Work includes demolition of all walls (reinforced CMU & concrete) on the upper six levels and major demolition of drywall partitions on the main level. Demolition also includes window removal, the main entrance and removal of the majority of existing building systems including plumbing, mechanical, electrical and fire protection.

New construction includes new front entrance, interior drywall partitions, doors/frames/hardware; floor wall, and ceiling finishes; casework, elevator modernization, new aluminum storefront and glazing and new single-ply roofing system. Work also includes new HVAC systems, new plumbing systems, new security cameras, and access control, CTV, data, fire alarm and new electrical/lighting systems.

Respondents or their sub-contractors must be licensed to perform all fields of required work in North Carolina. Participation of minority-owned and woman-owned businesses is encouraged but is not an evaluation factor. It is prohibited to pay any fee, commission, percentage, or brokerage fee to any person or firm contingent upon or resulting from award of a contract for this project. Qualified General Contractors may access electronic copy of the Bidding Documents from the Architects ShareFile website. To get access to the website you must be a licensed contractor. The Architect will ask you to fill out a bidder information form (company name and NC license number, business address, contact person, phone number and email address) which will put you on the Bidders List. Once the form is completed you will be given access to the Architect's ShareFile website for plans and specifications.

Subcontractors and vendors can obtain Bid Documents through General Contractors on the bidders list. Bid Documents will also be available through the following Plan Rooms: The Hispanic Contractors Association of the Carolinas (HCAC) and Carolina AGC through www.iSqFt.com , Dodge Data & Analytics, Construction Journal and Sharpe Images (Winston-Salem).

Hard copies of the Plans and specifications may be purchased (non refundable) directly from the Sharpe Images Inc. Winston Salem NC

Mandatory prebid walk-through/site access for Contractors to the Guilford County Law Enforcement Center, 401 W. Sycamore Street, Greensboro, NC 27401 will be conducted by Guilford County Facilities and Parks on **July 10, 2018** and **July 17, 2018** at 9:00am. Contractors must attend one of the prebid walk throughs in order to be eligible to submit a bid.

Bids Responses must be received by the event close date and time of* July 26, 2018 @ *3:00 PM (est).

Bid opening location to be determines will be issued by Addendum.

Bids received after the bid date and time will not be considered. Faxed bids will not be accepted.

Submit Bids for Guilford County Law Enforcement Center in a sealed envelope containing one (1) original Document 00300-FORM OF PROPOSAL, with all required attachments.

Submit bids in the manner designated on the form and required by the Project Manual to the address listed below:

Guilford County Purchasing Department
Basement Room B-32
Old County Courthouse, 301 W. Market Street
Greensboro, North Carolina 27401

DOCUMENT 00100 – INVITATION TO BID

The bid envelope(s) shall clearly indicate that the enclosed bid is for:

PROPOSAL FOR EVENT # 625
Guilford County Law Enforcement Center
401 W. Sycamore Street, Greensboro, NC 27401
Guilford County Law Enforcement Center Renovation

Submissions will not be retained or returned. No bid may be withdrawn for a period of 90 days after the bid opening date.

Bids must be accompanied by the following documents in duplicate:

1. Minority Business Participation Requirements and Affidavits
2. Document 00335 - E-Verify Affidavit
3. Document 00480 - Non-Collusion Affidavit.
4. Document 00486 - Consent of Surety
5. Document 00490 - Contractor's Qualification Statement (AIA A305)
6. Bid bond, cashier's check or certified check, payable to Guilford County in the amount of not less than 5% of the bid.
7. Any other bid forms required by the Document 00200 INSTRUCTIONS TO BIDDERS.

During the Bidding Period, questions will be taken until 3:00 P.M., 7 (seven) days prior to bid due date.

Any and all DOCUMENT CLARIFICATION REQUEST concerning the bid documents are to be emailed to the office of the Architect, at Walter Robbs Callahan & Perice Architects, PA to the attention of: Matt Messick (mattm@walterrobbs.com) or Clark Pierce (clarkp@walterrobbs.com).

Telephone inquiries concerning the bid documents will not be responded to by the Architect or Guilford County. *Responses will be distributed to all bidders by Addendum as required.*

END OF DOCUMENT 00100

DOCUMENT 00200 – INSTRUCTIONS TO BIDDERS

PART 1 - PRE-BID REQUIREMENTS

1.1. INTENT

A The Architect has made every effort to set forth in the Bid Documents the complete scope of the Work. Nevertheless, minor omissions and discrepancies shall not excuse the Bidder from providing a price to totally complete the project in accordance with the intent of these documents.

1 Bring any conflicts, omissions, or discrepancies to the attention of the Architect prior to submission of an executed bid form.

2 After execution of the Contract, no extra charges will be allowed for items of work where such are concluded to conform to normal construction practices and methods.

1.2 CONFIRMATION

A Inquiries: Notify the Architect if the meaning of the documents is in doubt, or if discrepancies or omissions are noted. An Addendum clarifying the issue in question will be sent to all Bidders.

1 All inquiries are to be submitted on Document Clarification Request Form located in Document 00215. Submit all inquiries to the Architect.

2 If any bidder is in doubt as to the true meaning of any part of the Documents, he shall request an interpretation from the Architect. Requests shall be made in time to allow the Architect to evaluate the request and to issue a formal clarification no later than seven (7) working days prior to scheduled bid date.

3 Whenever there are discrepancies between Drawings, or between the Drawings and Specifications, or conflicts within the Specifications, and such discrepancy is not called to the Architect's attention in time to permit clarification by Addendum, the bidder shall base his bid upon providing the better quality or greater quantity of work or material called for, shall submit a written statement with his proposal noting such discrepancies, and shall so furnish and install such better quality or greater quantity unless otherwise ordered in writing.

B Site Inspection: Visit the location where the Work is to be performed, become thoroughly familiar with all conditions affecting the work, and compare conditions with the Bid Documents. No consideration will be granted for any misunderstanding of existing conditions resulting from failure to visit the site.

1.3 CONTRACT FORMS

A Read carefully and become familiar with the forms identified in the List of Contract Forms.

1 Should the Owner elect to enter into an agreement to execute the Work, the listed forms shall be used.

2 Applicable forms are bound into the Project Manual.

DOCUMENT 00200 – INSTRUCTIONS TO BIDDERS

1.4 LAWS AND REGULATIONS

A All applicable federal, state, and local laws and ordinances, as well as the rules and regulations of the jurisdiction where the work is to be executed, shall apply to the Contract throughout. These will be deemed to be included in the Contract to the same extent as though herein written, including, but not limited to the following:

1 Rules and regulations issued by the NC Department of Labor, Occupational safety and Health Division.

2 Rules and regulations issued by the N.C. Department of Environment and Natural Resources.

3 Rules and regulations issued by the Guilford County Planning & Development Department, Permitting and Inspections and Soils and Erosion Control Sections.

1.5 COMPLETION TIME

A Evaluation of each Bid will include serious consideration of the time of completion. The Bidder shall be prepared to execute the Contract to accommodate the Owner's commitments and shall govern himself accordingly in completing the Bid Form. This project is scheduled to be completed in 420 calendar days from Notice to Proceed.

1.6 SUBSTITUTIONS

A It shall not be incumbent upon the Owner and/or the Architect to consider any items submitted for substitution but only those, in their judgment, meriting consideration. All requests for substitution by Sub-contractors or Material Suppliers will be considered only when made and approved through a qualified Bidder and when submitted with sufficient information to evaluate the product/materials being considered. All requests shall comply with the following:

1. The equipment and/or product submitted must equal in all ways to the specified equipment or product. The Architect will make the final decision in conjunction with Guilford County.
2. The proposer of the substitution of equipment or product shall identify any delay to the schedule for work, inspections, or tests which might result from the use of the proposed substitution."

PART 2 - BID PROCEDURES

2.1 PREPARATION OF BIDS

A The Bid shall be prepared using the Bid Form template in the specifications by the architect; no other forms will be considered.

1 Bids shall be submitted as directed by the INVITATION TO BID.
2 Bids shall include the Bidder's legal name, fully written.
3 Oral, telegraphic, or other modifications will not be considered.

B. Bid Forms shall be sent to the Owner as indicated in the Invitation to Bid Letter.

DOCUMENT 00200 – INSTRUCTIONS TO BIDDERS

2.2 OWNER'S RESPONSE TO BIDS

A Submitted Bid Forms will be opened and read publicly on the date indicated in the Invitation to Bid Letter. Notice of award will be made by the Owner after consideration of Bids received.

C The Owner reserves the right to respond to the Bids as follows:

1 Reject any or all Bids without explanation.
2 Waive non-material technicalities.
3 Advertise for new bids.
4 Proceed to do the work otherwise.

D The following Bids may be rejected as being non-responsive:

1 Bids that fail to meet the requirements of these instructions.
2 Bids that are incomplete, conditional, or obscure.
3 Bids that contain additions not called for, erasures, alterations, or other irregularities.
4 Bids that contain abnormally high or abnormally low prices for any class or item of work.

PART 3 - CONTRACT EXECUTION

3.1 POST-BID SUBMITTALS

A After notification of selection as apparent lowest responsive, responsible bidder of a Contract, the Bidder shall submit the following to the Owner in writing.

1 A designation of the work to be performed with the Bidder's own forces.
2 Names of the manufacturers, products and the suppliers of principal items or systems of materials and equipment proposed for the Work.
3 Names of persons or entities proposed for the execution of principal portions of the Work.

B The County will notify the Bidder in writing if either the Owner or Architect has reasonable objection to a Subcontractor proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed Subcontractor, the Bidder may, at the Bidder's option:

1 Withdraw the bid.
2 Submit an acceptable substitute subcontractor with an adjustment in the Bid to cover the difference in cost. NOTE: Withdrawal of bid may lead to a forfeiture of Bid Bond where appropriate.

C The Owner may accept the adjusted Bid Price or disqualify the Bidder. Persons and entities accepted by the Owner and Architect must be used on the work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

DOCUMENT 00200 – INSTRUCTIONS TO BIDDERS

3.2 INSURANCE AND BONDS

A Insurance: Upon receipt of a written "Letter of Intent", the Bidder shall furnish to the Owner a certificate of insurance in compliance with the requirements of the following:

1 General Conditions of the Contract.
2 Supplementary Conditions of the Contract.

B Performance and Payment Bonds: Upon receipt of a Letter of Intent, the Bidder shall furnish to the Owner a Performance Bond and Labor & Materials Payment Bond, both for the full amount of the Contract.

1 The bonds shall be provided by a properly qualified surety company.
2 The cost of the Performance and Payment Bonds shall be indicated on the Bid Form and shall be included in the total proposed Contract Amount.

3.3 LABOR FORCE

A Non-Discrimination: The Bidder is advised that the Owner will not tolerate any discrimination on the basis of age, gender, race, national origin, or sexual orientation by the Bidder or Subcontractors.

END OF DOCUMENT 00200

DOCUMENT 00215 – DOCUMENT CLARIFICATION REQUEST (DCR)

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work Specified in This Section:
   1. This Section specifies administrative and procedural requirements for disposition of Document Clarification Request (DCR's) during the Bidding Phase.

1.2 SUBMITTALS

A. Submit each request (DCR) on the form included in this Section.

B. Provide only one request on each form.

C. Email DCR form to Walter Robbs Callahan & Pierce Architects, PA to the attention of: Matt Messick at mattm@walterrobbs.com or Clark Pierce at clarkp@walterrobbs.com.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 CONDITIONS

A. Submit requests to the Architect as soon as possible.

B. DCR's will be received up to (7) calendar days prior to the Bid date. DCR's received after that date will not be reviewed.

3.2 ARCHITECTS ACTION:

A. The Architect will review the information requested.

B. The Architect's response will be in the space provided on the DCR form included in this Section.

DOCUMENT 00215 – DOCUMENT CLARIFICATION REQUEST (DCR)

Contractor DCR #: **Date:**

Submitted By:

Attention: Walter Robbs Callahan & Pierce Architects, PA
Matt Messick at mattm@walterrobbs.com or Clark Pierce at clarkp@walterrobbs.com.

Subject:

Specification Reference:

Drawing Sheet Number/Detail Reference:

INFORMATION REQUESTED

Signed:_____

RESPONSE **By:** **Date:**

☐ See Drawings/Specifications:

☐ See Addenda to be issued:

☐ Other

☐ See attachments

END OF DOCUMENT 00215

DOCUMENT 00300 – FORM OF PROPOSAL

Attention: Susan Crotts, Purchasing Director – Guilford County Facilities and Parks

Event Number: 625

Bidder: _____

Address: _____

Telephone #: _____

Bid Date: _____

The undersigned, as bidder, hereby declares that the only person or persons interested in this proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this proposal or in the contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is in all respects fair and in good faith without collusion or fraud. The bidder further declares that he has examined the site of the work and the contract documents relative thereto, and has read all special provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed. The bidder further declares that he and his subcontractors have fully complied with NCGS 64, Article 2 in regards to E-Verification as required by Section 2.(c) of Session Law 2013-418, codified as N.C. Gen. Stat. § 143-129(j).

The Bidder, by signing below, in consideration of the mutual promises, contained herein and other good and valuable consideration, the receipt and sufficiency hereby acknowledged, agrees to the terms and conditions set out herein.

Bidder agees that upon acceptance the Guilford County, this Bid Package shall be deemed as a binding contract subject to the terms set out herein. It is acknowledged that the terms in the Document 00500-1 *et seq.,* entitled Contract, shall be binding should any issues arise over possibly inconsistent or conflicting language. This Contract shall be in full force and effect upon execution by all parties for the terms as set forth in Section 4, of the Contract found in Document 00500.

Bidder further agree to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the:

Event # 625

Guilford County Law Enforcement Center
401 W. Sycamore Street, Greensboro, NC 27401
Guilford County Law Enforcement Center Renovation

in full in complete accordance with the plans, specifications and contract documents, to the full and entire satisfaction of the

GUILFORD COUNTY FACILITIES AND PARKS DEPARTMENT and Walter Robbs Callahan & Pierce Architects, PA

with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and the contract documents, for the sum of:

DOCUMENT 00300 – FORM OF PROPOSAL

SINGLE PRIME CONTRACT:

BASE BID:

_____Dollars($)_____

GENERAL CONTRACTOR:

_____Lic_____

ELECTRICAL SUBCONTRACTOR:

_____Lic_____

MECHANICAL SUBCONTRACTOR:

_____Lic_____

_____Lic_____

GUILFORD COUNTY:

_____

ATTEST:

_____

GS143-128(d) requires all single prime bidders to identify their subcontractors for the above subdivisions of work. A contractor whose bid is accepted shall not substitute any person as subcontractor in the place of the subcontractor listed in the original bid, except if the listed subcontractor's bid is later determined by the contractor to be non-responsible or non-responsive or the listed subcontractor refuses to enter
into a contract for the complete performance of the bid work, or (ii) with the approval of the awarding authority for good cause shown by the contractor.

DOCUMENT 00300 – FORM OF PROPOSAL

PROJECT DURATION

Bid Project Duration is 420 Calendar days from notice to proceed).

ATTACHMENTS TO BE INCLUDED WITH PROPOSAL

1. **Minority Business Participation Requirements and Affidavits**

Provide with the bid - Under GS 143-128.2(c) the undersigned bidder shall identify **on its bid** (Identification of Minority Business Participation Form) the minority businesses that it will use on the project with the total dollar value of the bids that will be performed by the minority businesses. **Also** list the good faith efforts (Affidavit **A**) made to solicit minority participation in the bid effort.

NOTE: A contractor that performs all of the work with its own workforce may submit an Affidavit (**B)** to that effect in lieu of Affidavit (**A)** required above. The MB Participation Form must still be submitted even if there is zero participation.

After the bid opening - The Owner will consider all bids and alternates and determine the lowest responsible, responsive bidder. Upon notification of being the apparent low bidder, the bidder shall then file within 72 hours of the notification of being the apparent lowest bidder, the following:

An Affidavit (**C**) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the 10% goal established. This affidavit shall give rise to the presumption that the bidder has made the required good faith effort and Affidavit **D** is not necessary;

*** OR ***

If less than the 10% goal, Affidavit (**D**) of its good faith effort to meet the goal shall be provided. The document must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations and other specific actions demonstrating recruitment and selection of minority businesses for participation in the contract.

***Note**: Bidders must always submit **with their bid** the Identification of Minority Business Participation Form listing all MB contractors, vendors and suppliers that will be used. If there is no MB participation, then enter none or zero on the form. Affidavit A **or** Affidavit B, as applicable, also must be submitted with the bid. Failure to file a required affidavit or documentation with the bid or after being notified apparent low bidder is grounds for rejection of the bid.*

2. **Document 00335 - E-Verify Affidavit**
3. **Document 00480 - Non-Collusion Affidavit.**
4. **Document 00486 - Consent of Surety**
5. **Document 00490 –Contractor's Qualification Statement (AIA A305)**
6. **Bid bond, cashier's check or certified check, payable to Guilford County in the amount of not less than 5% of the bid.**
7. **Any other bid forms required by the Document 00200 INSTRUCTIONS TO BIDDERS.**

DOCUMENT 00300 – FORM OF PROPOSAL

PROPOSAL SIGNATURE PAGE

The undersigned further agrees that in the case of failure on his part to execute the said contract and the bonds within ten (10) consecutive calendar days after being given written notice of the award of contract, the certified check, cash or bid bond accompanying this bid shall be paid into the funds of the owner's account set aside for the project, as liquidated damages for such failure; otherwise the certified check, cash or bid bond accompanying this proposal shall be returned to the undersigned.

Respectfully submitted this day of _____

_____
(Name of firm or corporation making bid)

WITNESS:

_____
(Proprietorship or Partnership)

By:_____
Signature

Name: _____
Print or type

Title_____
(Owner/Partner/Pres./V.Pres)

Address_____

ATTEST:

By:_____

Title:_____
(Corp. Sec. or Asst. Sec. only)

_____

License No._____

Federal I.D. No. _____

Email Address: _____

(AFFIX CORPORATE SEAL)

Acknowledge of mandatory prebid walk-through/site access attendance:
General Contractor (Y) (N)

Acknowledge attachments included with proposal:

Attachment No. 1 A___, B___, C___, D___ *(check all that apply)*

Attachment No. 2_____, Attachment No. 3_____, Attachment No. 4_____, Attachment No. 5_____,
Attachment No. 6_____, Attachment No. 7 (List Other) _____

Acknowledge addendum received and used in computing bid:

Addendum No. 1 _____ Addendum No. 3 _____ Addendum No. 5_____ Addendum No. 6_____
Addendum No. 2 _____ Addendum No. 4 _____ Addendum No. 6 _____ Addendum No. 7_____

END OF DOCUMENT 00100

Guilford County Law Enforcement Center
401 W. Sycamore Street, Greensboro, NC 27401
Guilford County Law Enforcement Center Renovation

DOCUMENT 00311 – SCHEDULE OF VALUES

Division	Discription	Scheduled Amount
DIVISION 0		
Document 00821	SUPPLEMENTARY GENERAL CONDITIONS OF THE CONTRACT	$ _____
DIVISION 1		
SECTION 01 10 00	SUMMARY	$ _____
SECTION 01 21 00	ALLOWANCES	$ _____
SECTION 01 23 00	ALTERNATES AND UNIT PRICES	$ _____
SECTION 01 25 00	CONTRACT MODIFICATIONS PROCEDURES	$ _____
SECTION 01 31 00	PROJECT COORDINATION	$ _____
SECTION 01 31 50	PROJECT MEETINGS	$ _____
SECTION 01 33 00	SUBMITTALS	$ _____
SECTION 01 35 20	GENERAL PROJECT PROCEDURES	$ _____
SECTION 01 41 00	SPECIAL INSPECTIONS	$ _____
SECTION 01 42 10	REFERENCE STANDARDS AND DEFINITIONS	$ _____
SECTION 01 45 00	QUALITY CONTROL/QUALITY ASSURANCE	$ _____
SECTION 01 50 00	TEMPORARY FACILITIES	$ _____
SECTION 01 63 00	PRODUCT SUBSTITUTION	$ _____
SECTION 01 74 00	FINAL CLEANING	$ _____
SECTION 01 75 00	DOCUMENTS AT PROJECT SITE	$ _____
SECTION 01 78 10	PROJECT CLOSEOUT	$ _____
SECTION 01 78 80	WARRANTIES AND BONDS	$ _____
SECTION 01 83 00	EQUIPMENT MAINTENANCE AND OPERATIONS PROGRAM	$ _____
DIVISION 2		
SECTION 02 22 00	SITE DEMOLITION	$ _____
SECTION 02 22 10	SELECTIVE DEMOLITION	$ _____
DIVISION 3 - CONCRETE		
SECTION 03 10 00	CONCRETE FORMWORK	$ _____
SECTION 03 20 00	CONCRETE REINFORCEMENT	$ _____
SECTION 03 25 00	ADHESIVE ANCHORS	$ _____
SECTION 03 30 00	CAST-IN-PLACE CONCRETE	$ _____
DIVISION 4 - MASONRY		
SECTION 04 06 00	MASONRY MORTAR	$ _____
SECTION 04 20 00	UNIT MASONRY	$ _____
DIVISION 5 - METALS		
SECTION 05 12 00	STRUCTURAL STEEL FRAMING	$ _____
SECTION 05 31 00	STEEL DECKING	$ _____
SECTION 05 50 00	MISCELLANEOUS METAL FABRICATIONS	$ _____

SECTION 05 81 00	PREFABRICATED EXPANSION JOINT COVERS	$ _____

DIVISION 6 - WOOD AND PLASTICS

SECTION 06 10 00	ROUGH CARPENTRY	$ _____
SECTION 06 20 00	FINISH CARPENTRY	$ _____

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

SECTION 07 13 10	SHEET APPLIED WATERPROOFING AND DRAINAGE COMPOSITE	$ _____
SECTION 07 20 00	RIGID INSULATION	$ _____
SECTION 07 21 10	FLEXIBLE INSULATION	$ _____
SECTION 07 54 00	FULLY ADHERED THERMOPLASTIC POLYOLEFIN (TPO) ROOFING	$ _____
SECTION 07 62 00	FLASHING AND SHEET METAL	$ _____
SECTION 07 81 10	SPRAYED-ON FIREPROOFING	$ _____
SECTION 07 84 00	FIRESTOPPING	$ _____
SECTION 07 90 00	SEALANTS	$ _____

DIVISION 8 - DOORS AND WINDOWS

SECTION 08 11 00	HOLLOW METAL DOORS AND FRAMES	$ _____
SECTION 08 14 00	WOOD DOORS	$ _____
SECTION 08 17 00	INTEGRATED DOOR OPENING ASSEMBLIES	$ _____
SECTION 08 31 00	ACCESS DOORS	$ _____
SECTION 08 41 10	ALUMINUM STOREFRONT FRAMING AND ENTRY DOORS	$ _____
SECTION 08 58 31	EXCHANGE WINDOWS	$ _____
SECTION 08 71 00	DOOR HARDWARE	$ _____
SECTION 08 72 10	AUTOMATIC DOOR OPERATORS	$ _____
SECTION 08 80 00	GLASS AND GLAZING	$ _____

DIVISION 9 - FINISHES

SECTION 09 29 00	GYPSUM DRYWALL	$ _____
SECTION 09 30 00	CERAMIC TILE	$ _____
SECTION 09 51 00	ACOUSTICAL CEILINGS	$ _____
SECTION 09 54 50	CURVED METAL CEILING	$ _____
SECTION 09 65 00	RESILIENT FLOORING	$ _____
SECTION 09 68 10	CARPET TILE	$ _____
SECTION 09 91 00	FIELD PAINTING	$ _____

DIVISION 10 - SPECIALTIES

SECTION 10 11 00	VISUAL DISPLAY BOARDS	$ _____
SECTION 10 14 00	SIGNAGE	$ _____
SECTION 10 14 43	LUMINOUS EGRESS PATH MARKING SYSTEMS	$ _____
SECTION 10 21 13	SOLID PLASTIC TOILET PARTITIONS	$ _____
SECTION 10 28 00	TOILET ACCESSORIES	$ _____
SECTION 10 35 00	FLAGPOLES	$ _____
SECTION 10 41 00	BUILDING DIRECTORY	$ _____
SECTION 10 50 00	LOCKERS	$ _____
SECTION 10 52 00	FIRE PROTECTION SPECIALTIES	$ _____

DIVISION 12 - FURNISHINGS

SECTION 12 30 40	LAMINATE CLAD CASEWORK	$ _____

DIVISION 14 - CONVEYING SYSTEMS

SECTION 14 21 50	ELECTRIC GEARED TRACTION PASSENGER ELEVATORS	$ _____

DIVISION 21 – FIRE SUPPRESSION

SECTION 21 00 00	FIRE PROTECTION SYSTEMS	$ _____

DIVISION 22 - PLUMBING

SECTION 22 05 00	SUMMARY OF THE WORK	$ _____
SECTION 22 05 10	BASIC PLUMBING MATERIALS AND METHODS	$ _____
SECTION 22 05 13	ELECTRICAL REQUIREMENTS FOR PLUMBING EQUIPMENT	$ _____
SECTION 22 05 23	PLUMBING VALVES	$ _____
SECTION 22 05 29	PLUMBING HANGERS AND SUPPORTS	$ _____
SECTION 22 07 00	PLUMBING INSULATION	$ _____
SECTION 22 10 00	PLUMBING PIPING	$ _____
SECTION 22 11 19	PLUMBING SPECIALTIES	$ _____
SECTION 22 11 23	PLUMBING PUMPS	$ _____
SECTION 22 34 00	GAS WATER HEATERS	$ _____
SECTION 22 40 00	PLUMBING FIXTURES	$ _____
SECTION 22 51 00	PLUMBING BREECHINGS, CHIMNEYS AND STACKS	$ _____
SECTION 22 70 00	NATURAL GAS PIPING SYSTEMS	$ _____

DIVISION 23 - MECHANICAL

SECTION 23 05 00	SUMMARY OF THE WORK	$ _____
SECTION 23 05 10	BASIC MECHANICAL MATERIALS AND METHODS	$ _____
SECTION 23 05 13	ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT	$ _____
SECTION 23 05 15	ADJUSTABLE FREQUENCY DRIVES	$ _____
SECTION 23 05 19	MECHANICAL METERS AND GAUGES	$ _____
SECTION 23 05 23	MECHANICAL VALVES	$ _____
SECTION 23 05 29	MECHANICAL HANGERS AND SUPPORTS	$ _____
SECTION 23 05 48	MECHANICAL VIBRATION AND SEISMIC CONTROLS	$ _____
SECTION 23 05 93	TESTING, ADJUSTING AND BALANCING	$ _____
SECTION 23 07 00	MECHANICAL INSULATION	$ _____
SECTION 23 08 60	COMMISSIONING OF BUILDING AUTOMATION SYSTEMS	$ _____
SECTION 23 09 00	AUTOMATIC TEMPERATURE CONTROLS	$ _____
SECTION 23 09 23	AIRFLOW INSTRUMENTS	$ _____
SECTION 23 20 00	MECHANICAL HYDRONIC PIPING	$ _____
SECTION 23 21 23	HYDRONIC PUMPS	$ _____
SECTION 23 25 00	HVAC WATER TREATMENT	$ _____
SECTION 23 31 00	METAL DUCTWORK	$ _____
SECTION 23 33 00	DUCT ACCESSORIES	$ _____
SECTION 23 34 00	POWER VENTILATORS	$ _____
SECTION 23 36 00	AIR TERMINALS	$ _____
SECTION 23 37 00	AIR OUTLETS AND INLETS	$ _____
SECTION 23 37 23	INTAKE AND RELIEF VENT	$ _____
SECTION 23 40 00	MECHANICAL AIR CLEANING	$ _____
SECTION 23 51 00	MECHANICAL BREECHING, CHIMNEYS AND STACKS	$ _____
SECTION 23 52 16	CONDENSING BOILERS	$ _____
SECTION 23 64 00	AIR COOLED CHILLERS	$ _____
SECTION 23 73 00	CENTRAL STATION AIR HANDLING UNITS	$ _____
SECTION 23 75 00	OUTSIDE AIR UNITS	$ _____

SECTION 23 82 39	UNIT HEATERS	$ _____

DIVISION 26 - ELECTRICAL

SECTION 26 05 00	GENERAL REQUIREMENTS	$ _____
SECTION 26 05 19	CONDUCTORS AND CABLES	$ _____
SECTION 26 05 26	GROUNDING AND BONDING	$ _____
SECTION 26 05 29	HANGERS AND SUPPORTS	$ _____
SECTION 26 05 33	RACEWAYS AND FITTINGS	$ _____
SECTION 26 05 36	CABLE TRAYS	$ _____
SECTION 26 05 37	DATA / COMMUNICATIONS RACEWAYS AND FITTINGS	$ _____
SECTION 26 05 48	VIBRATION AND SEISMIC CONTROLS	$ _____
SECTION 26 05 53	ELECTRICAL IDENTIFICATION	$ _____
SECTION 26 22 00	LOW VOLTAGE TRANSFORMERS	$ _____
SECTION 26 24 13	SWITCHBOARDS	$ _____
SECTION 26 24 16	PANELBOARDS	$ _____
SECTION 26 27 26	WIRING DEVICES	$ _____
SECTION 26 28 13	FUSES	$ _____
SECTION 26 28 16	ENCLOSED SWITCHES AND CIRCUIT BREAKERS	$ _____
SECTION 26 51 00	INTERIOR LIGHTING	$ _____

DIVISION 27 - COMMUNICATION

SECTION 27 11 00	MOUNTING ELEMENTS	$ _____
SECTION 27 12 00	COMMUNICATIONS GROUNDING AND BONDING	$ _____

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

SECTION 28 31 00	FIRE DETECTION AND ALARM	$ _____

DIVISION 31 - EARTHWORK

SECTION 31 10 00	SITE CLEARING AND STRIPPING	$ _____
SECTION 31 20 00	EARTHWORK	$ _____
SECTION 31 25 00	EROSION AND SEDIMENTATION CONTROL	$ _____

DIVISION 32 – EXTERIOR IMPROVEMENTS

SECTION 32 13 00	CONCRETE WALKS, STEPS AND PAVING	$ _____

END OF SECTION 00311

DOCUMENT 00330 – MBE GUIDELINES AND AFFIDAVITS

COVER PAGE INCLUSIVE OF

1. REQUIREMENTS PERTAINING TO THE PARTICIPATION OF MINORITY BUSINESSES IN BUILDING (CONSTRUCTION – REPAIR) CONTRACTS FOR GUILFORD COUNTY, NC

2. IDENTIFICATION OF MINORITY BUSINESSES PARTICIPATION *(Attach to Bid)*

3. AFFIDAVIT A – LISTING OF THE GOOD FAITH EFFORT *(Attach to Bid)*

4. AFFIDAVIT B - INTENT TO PERFORM CONTRACT WITH OWN WORKFORCE *(Attach to Bid)*

5. AFFIDAVIT C – PORTION OF THE WORK TO BE PERFORMED BY MINORITY FIRMS (Do not submit with *bid)*

6. AFFIDAVIT D – GOOD FAITH EFFORTS *(To be submitted only by the apparent lowest responsible, responsive bidder)*

7. APPENDIX E – MBE DOCUMENTATION FOR CONTRACT PAYMENTS *(To be submitted with each pay request – Final Payments – Final Reports by awarded bidder)*

REQUIREMENTS PERTAINING TO THE PARTICIPATION OF MINORITY BUSINESSES IN BUILDING (CONTRUCTION - REPAIR) CONTRACTS FOR GUILFORD COUNTY, N.C.

Date 1-1-02

One primary responsibility of Guilford County (GC) government is the proper use of public revenue to purchase the various items, services, construction and repairs needed to operate. All expenditures of county funds must be in accordance with the NC laws. Construction contracts are subject to applicable laws, including Article 8, N.C.G.S. Chapter 143, which shall control in the event of any conflict.

For building (construction - repair), whose estimated total cost is $500,000 or more, a formal bid process is required. This generally consists of written specifications, advertisement, bid bond, usually a prebid meeting, at least three responses on the first opening, public opening of bids, Commissioners' approval, notice of award to all participants, and written contract.

Specifications for building (construction - repair) projects requiring an expenditure of $500,000 or more requires separate specifications for the following areas of work:

Heating, Ventilating and Air Conditioning (HVAC)
Plumbing
Electrical
General

and may be bid separate-prime (allowing bids for each of the above categories), single- prime (a bid for the total project), or dual-prime, as provided in Article 8, N.C.G.S. Chapter 143. Award is made to the lowest responsive, responsible bidder(s), as provided by law.

Contractors who bid single-prime must identify in their bid response the names of each sub-contractor for HVAC, Plumbing and Electrical.

For building (construction - repair) projects requiring an expenditure of $100,000 or more, state law (G.S. 143-128.2) requires the public government (awarding authority) involved to adopt, after a public notice and a public hearing, an appropriate verifiable percentage goal for participation by minority business in the total value of work for each building (construction - repair) contract awarded. G.S. 143-128.2 must be read, understood, and complied with by each bidder.

Guilford County has established its verifiable minority participation goal on 3-5-90 at ten (10) percent.

In addition, each separate-prime and single-prime contractor must establish its own goal when dealing with sub-contractors and provide appropriate documentation to the awarding authority.

In each case, the responsibilities of auditing and compliance with this law is that of the awarding authority, which in this case is Guilford County.

A minority business is defined as ownership of 51% or more by a minority. Minorities are officially defined as:

(a) Black, that is, a person having origins in any of the black racial groups in Africa;
(b) Hispanic, that is, a person of Spanish or Portuguese culture with origins in Mexico, in South or Central America, or the Caribbean Islands, regardless of race;
(c) Asian American, that is, a person with origins in any of the original peoples of the Far East, Southeast Asia and Asia, the Indian subcontinent, or the Pacific Islands;
(d) American Indian, that is, a person having origins in any of the original Indian peoples of North America; or
(e) Female.

(Requirements - continued)

The Guilford County method of compliance is basically as follows:

1. For any expenditure of funds, including building construction and repair, it is GC's policy to give every supplier, business or contractor in Guilford County an equal and fair opportunity to participate. In order to accomplish this, we maintain a list of all suppliers, businesses and contractors. We have also identified all minorities on this list and we update this list on a continuous basis.

2. When bids are needed for any item, service, construction or repair, we make sure that all on our list are contacted by mail and/or phone. Larger expenditure items requiring formal bids are advertised.

3. All building construction and repair contracts over $500,000 would be in the formal bid range requiring the mailing of bid packages (specifications), advertising and prebid meetings. All contractors on our list will either be mailed a copy of the bid package or notified in writing as to how a bid package can be obtained. All contractors on our list will also be invited to our prebid meetings.

4. In our bid package and at our prebid meeting, we explain that every contractor will be given an equal opportunity to obtain all or part of the contract award. Guilford County is ready and willing to work with any contractor to help it understand and properly compete for contract awards. The other requirements of G.S. 143-128.2 and G.S. 143-128.3 will be complied with by the County, when applicable.

5. Guilford County maintains a record as to who was awarded contracts and with the minority identification GC can state the percentage of minority participation.

6. This goal of ten (10) percent is a goal, and is not a requirement, demand, set aside or guarantee to minorities. It is, however, a serious goal and we seek to achieve this goal, as explained above, by continuing to give every supplier, business and contractor an equal opportunity to participate but to make all purchases and to award all contracts on the basis of best value.

7. All bidders shall make the minority participation disclosures required by G.S. 143-128.2(c) and comply with the other requirements of G.S. 143-128.2.

The state law requires and Guilford County expects its contractors to deal with their sub-contractors in the same manner and the state law and Guilford County require verification that this approach is being followed. The minority percentage goal set by each contractor for their sub-contractors is up to them and does not necessarily have to agree with the ten (10) percent which has been set by Guilford County. The method in which all prime contractors plan to attain this goal is, however, very important to GC and must be fully explained and it will be audited by GC.

Guilford County will help any contractor in this effort by supplying a list of all minority suppliers by trade category. Guilford County will consider a "good faith" effort by the contractor involved if the contractor makes a positive effort to contact each minority supplier and to allow each an equal opportunity to quote on the particular work involved.

If anyone has questions concerning GC's approach to the minority participation percentage goal, what is covered here, what is covered by the GC resolution, or the NC laws, they should contact Guilford County Purchasing at 336-641-3226.

(Requirements - continued)

MINORITY BUSINESS PARTICIPATION REQUIREMENTS

Provide on the bid - Under GS 143-128.2(c) the undersigned bidder shall identify **on its bid** (Identity of Minority Business Participation Form)the minority businesses that it will use on the project with the total dollar value of the bids that will be performed by the minority businesses. **Also** list the good faith efforts (Affidavit **A**) made to solicit minority participation in the bid effort.

Note: A contractor that performs all of the work with its own workforce may submit an Affidavit (**B)** to that effect in lieu of the participation form and Affidavit (**A)** required above.

After the bid opening - The Owner will consider all bids and alternates and determine the lowest responsible, responsive bidder. Upon notification of being the apparent low bidder, the bidder shall then file within 72 hours of the notification of being the apparent lowest bidder, the following:

An Affidavit (**C**) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the 10% goal established. This affidavit shall give rise to the presumption that the bidder has made the required good faith effort and Affidavit **D** is not necessary;

OR

If less than the 10% goal, Affidavit (**D**) of its good faith effort to meet the goal shall be provided. The document must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations and other specific actions demonstrating recruitment and selection of minority businesses for participation in the contract.

Note: Bidders must submit **with their bid** the Identification of *Minority Business Participation* list and *Affidavit A* **or** *Affidavit B* as applicable. Failure to file a required affidavit or documentation with the bid or after being notified apparent low bidder may be grounds for rejection of the bid.

R09-02

Attach to Bid **Attach to Bid** **Attach to Bid** **Attach to Bid** **Attach to Bid**

Identification of Minority Business Participation

I,_____,
(Name of Bidder)

do hereby certify that on this project, we will use the following minority business enterprises as construction subcontractors, vendors, suppliers or providers of professional services.

Firm Name, Address and Phone #	Work type	*Minority Category

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**), American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

The total value of minority business contracting will be ($)_____

R09-02

State of North Carolina - AFFIDAVIT A - Listing of the Good Faith Effort

County of _____

Affidavit of _____
(Name of Bidder)

Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive. (1 NC Administrative Code 30A .0101, et seq.)

- ☐ **1 – (10 pts)** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.
- ☐ **2 - (10 pts)** Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.
- ☐ **3 – (15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- ☐ **4** – **(10 pts)** Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- ☐ **5** – **(10 pts)** Attended prebid meetings scheduled by the public owner.
- ☐ 6 - (**20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- ☐ **7 – (15 pts)** Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- ☐ **8** – **(25 pts)** Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- ☐ **9** – **(20 pts)** Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- ☐ **10** – **(20 pts)** Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d). Failure to abide by this statutory provision will constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of the minority business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer: _____

Signature: _____

Title: _____

SEAL

State of North Carolina, County of _____

Subscribed and sworn to before me this _____ day of _____ 20_____

Notary Public _____

My commission expires _____

R09-02

Attach to Bid **Attach to Bid** **Attach to Bid** **Attach to Bid** **Attach to Bid**

State of North Carolina -AFFIDAVIT B - Intent to Perform Contract with Own Workforce.

County of _____

Affidavit of _____
(Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the

_____contract.
(Name of Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform all elements of the work on this project with his/her own current work forces; and

The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date:_____ Name of Authorized Officer: _____

Signature: _____

Title: _____

SEAL

State of North Carolina, County of_____

Subscribed and sworn to before me this _____day of _____20_____

Notary Public_____

My commission expires _____

R09-02

Do not submit with bid **Do not submit with bid** **Do not submit with bid** **Do not submit with bid**

State of North Carolina - AFFIDAVIT C - Portion of the Work to be Performed by Minority Firms

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the portion of the work to be executed by minority businesses as defined in GS143-128.2(g) is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit.
This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

_____
(Project Name)

Project ID# _____ Amount of Bid $ _____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below.

(Attach additional sheets if required)

Name and Phone Number	*Minority Category	Work description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**), American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____

SEAL

State of North Carolina, County of _____

Subscribed and sworn to before me this _____ day of _____ 20 _____

Notary Public _____

My commission expires _____

R09-02

Do not submit with bid **Do not submit with bid** **Do not submit with bid** **Do not submit with bid**

State of North Carolina - AFFIDAVIT D - Good Faith Efforts

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the goal of 10% participation by minority business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

Affidavit of _____

(Name of Bidder)

I do certify the attached documentation as true and accurate representation of my good faith efforts.

(Attach additional sheets if required)

Name and Phone Number	*Minority Category	Work description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**), American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

Documentation of the Bidder's good faith efforts to meet the goals set forth in these provisions. Examples of documentation include, but are not limited to, the following evidence:

A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State or local government for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.

B. Copies of quotes or responses received from each firm responding to the solicitation.

C. A telephone log of follow-up calls to each firm sent a solicitation.

D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.

E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.

F. Copy of pre-bid roster.

G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.

H. Letter detailing reasons for rejection of minority business due to lack of qualification.

I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

Date:_____ Name of Authorized Officer: _____

Signature: _____

Title: _____

SEAL

State of North Carolina, County of _____

Subscribed and sworn to before me this _____ day of _____ 20_____

Notary Public _____

My commission expires _____

R09-02

APPENDIX E

MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: _____

Address & Phone: _____

Project Name: _____

SCO Project ID: _____

Pay Application #: _____ **Period:** _____

The following is a list of payments made to Minority Business Entrprises on this project for the above-mentioned period.

MBE FIRM NAME	*TYPE OF MBE	AMOUNT PAID THIS MONTH (With This Pay App)	TOTAL PAYMENTS TO DATE	TOTAL AMOUNT COMMITTED

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**), American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

Approved/Certified by:

_____ _____
(Name) (Title)

_____ _____
(Date) (Signature)

SUBMIT WITH EACH PAY REQUEST-FINAL PAYMENT-FINAL REPORT

(Revised on 2/5/2008)

DOCUMENT 00335– E-VERIFY AFFIDAVIT

COVER PAGE

STATE OF NORTH CAROLINA

AFFIDAVIT

COUNTY OF GUILFORD

****

I, _____(the individual attesting below), being duly authorized by and on behalf of

_____ (the entity bidding on project hereinafter "Employer") after first being duly sworn hereby swears or affirms as follows:

1. Employer understands that E-Verify is the federal E-Verify program operated by the United States Department of Homeland Security and other federal agencies, or any successor or equivalent program used to verify the work authorization of newly hired employees pursuant to federal law in accordance with NCGS §64-25(5).

2. Employer understands that Employers Must Use E-Verify. Each employer, after hiring an employee to work in the United States, shall verify the work authorization of the employee through E-Verify in accordance with NCGS§64-26(a).

3. Employer is a person, business entity, or other organization that transacts business in this State and that employs 25 or more employees in this State. Mark “Yes” or “No”:

   a. YES _____; or,

   b. NO _____

4. Employer's subcontractors comply with E-Verify, and if Employer is the winning bidder on this project Employer will ensure compliance with E-Verify by any subcontractors subsequently hired by Employer.

This ____ day of _____, 20___.

_____

Signature of Affiant

Print or Type Name: _____

State of North Carolina County of Guilford

Signed and sworn to (or affirmed) before me, this the _____

day of _____, 20___.

My Commission Expires:

_____. _____

Notary Public

(Affix Official/Notarial Seal)

Guilford County Law Enforcement Center
401 W. Sycamore Street, Greensboro, NC 27401
Guilford County Law Enforcement Center Renovation

DOCUMENT 00480 – NON-COLLUSION AFFIDAVIT

STATE OF (North Carolina)
( ) SS.
COUNTY OF ( )

I, _____, of the Municipality of _____, In the County of _____ and the State of _____, of full age, being duly sworn according to law on my oath depose and say that:

I am _____, of the firm of _____, making the Proposal for the above- named authority.

My submission of a response to this event certifies that I agree to the non-collusion agreement contained below:

1. The submitter of this document is acting as an agent for their company who is the respondent that has submitted the attached bid response.
2. The undersigned person is fully informed concerning the preparation and contents of the attached response and of all pertinent circumstances related to it and is authorized to sign this affidavit. This affidavit is given under penalty of perjury as provided by law.
3. Such bid response is genuine and is not collusive or sham in anyway whatsoever.
4. Neither the person responding nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including the signer of this affidavit, have in any way colluded, conspired, connived or agreed, directly or indirectly, with any other respondent, firm or person to submit collusive or sham response in connection with the contract for which the attached response has been submitted or to refrain from responding in connection with such contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other responder, firm or person to fix the price, or cost to secure through collusion, conspiracy, connivance or unlawful agreement any advantage against the Board of County Commissioners, Guilford County or any person interested in the proposed contract.
5. The price or prices quoted in the attached response are fair and proper and are not derived by any collusion, conspiracy, connivance or lawful agreement and on the part of the respondent or any of its agents, representatives, owners, employees, or parties in interest.

_____
(Name of Contractor)

_____
Signature (Type or Print Name) Title Date

Subscribed and sworn to before me on this _____day of _____, 20 ___.

_____
Signature (Type or Print Name)

Notary Public of the State of _____

My Commission expires _____**, 20**_____**.**

END OF DOCUMENT 00480

Guilford County Law Enforcement Center
401 W. Sycamore Street, Greensboro, NC 27401
Guilford County Law Enforcement Center Renovation

SECTION 00481 – STATEMENT OF OWNERSHIP

I certify that the list below contains the names and home addresses of all stockholders holding 10% or more of the issued outstanding stock of the undersigned corporation. If one or more such stockholder or partner is itself a corporation or partnership, the stockholder holding 10% or more of that corporation's stock, or the individual partners owning 10% or greater interest in that partnership, as the case may be, are also listed.

_____
Corporate Name

Attest: _____ Date: _____

_____ _____
Secretary Officer

_____ _____
(Also, Print/Type Name) (Also, Print/Type Name)

Affix Corporation Seal

Stockholders:

Name: _____

Home Address: _____

_____

Name: _____

Home Address: _____

_____

Name: _____

Home Address: _____

_____

END OF DOCUMENT 00481

Guilford County Law Enforcement Center
401 W. Sycamore Street, Greensboro, NC 27401
Guilford County Law Enforcement Center Renovation

SECTION 00486 – CONSENT OF SURETY

The _____

_____
(Name and address of Bidder)

a corporation existing under the Laws of the State of

_____
and authorized to do business under the Laws of the State of North Carolina, hereby certifies that application has been made to us by

_____

_____
(Name and address of Bidder)

and satisfactory arrangements have been completed by which we have and do now agree to furnish a Performance Bond equal to 100% of the Contract to ensure the faithful performance on the part of the Bidder of the terms and conditions of the contract, and a labor and materials bond to ensure the payment of all persons furnishing labor and materials in accordance with the contract.

Title of Work: **Guilford County Law Enforcement Center Renovation**

Location of Project: 401 W. Sycamore Street, Greensboro, NC 27401

This proposition is made with the understanding that any change made in the specifications or agreements without the consent of the bondsmen shall in no way vitiate the bond.

WITNESS:

_____

SURETY COMPANY

_____

Title: _____

Attorney-In Fact

By: _____

Date: _____

(Affix corporate seal)

END OF DOCUMENT 00486

Guilford County Law Enforcement Center
401 W. Sycamore Street, Greensboro, NC 27401
Guilford County Law Enforcement Center Renovation

DOCUMENT 00490 – CONTRACTOR'S QUALIFICATION STATEMENT

A305™–2010-Contractor's Qualification Statement

(Included by reference)

OBTAIN AND COMPLETE AN ORIGINAL COPY OF AIA A305 AND ATTACH TO BID DOCUMENTS 00300 – FORM OF PROPOSAL AND 00310 - COMBINED FORM OF PROPOSAL.

Original Copies of AIA A305 may be ordered from:

AIA North Carolina
A Chapter of the
American Institute of Architects
14 E. Peace Street
Raleigh, NC 27604
Tel: 919-833-6656 or
On-line: http://www.aianc.org/order-documents

(Search Keyword: A305 - Usually ships within 3 business days)

GENERAL GUARANTEE

_____ guarantees all materials and workmanship incorporated
(Name of Contractor)
in the **Guilford County Law Enforcement Center** in Greensboro, NC, against defect due to faulty materials or faulty workmanship or negligence for a period of 12 months from completion of the Project for the General Guarantee and for such longer periods as may be designated by specific Sections of the Project Manual or by manufacturer's warranty on equipment, parts or materials.

This Guarantee is binding where defects occur due to normal usage conditions and does not cover willful or malicious damage, damage caused by acts of God or other casualty.

Sworn to and subscribed before me this _____ day of _____, 20 ____.

By _____

Title _____

_____
(Notary Public)

My Commission expires _____.

SINGLE PLY ROOFING WARRANTY

Know all men by these presents, that we, (Contractor), having installed insulation, roofing, flashing, and sheet metal work, and having accomplished certain other work on **Guilford County Law Enforcement Center**, under a Contract between Guilford County (Owner) and (Contractor), warrant to the Owner with respect to said work that for a period of 2 years from date of final acceptance of said work by the Owner, the roofing system including insulation, roofing membrane, flashings and sheet metal work related to roofing system shall be absolutely watertight and free from all leaks provided, however, that the following are excluded from this warranty:

1. Defects or failures resulting from abuse by the Owner.

2. Defects in design involving failure of (a) structural frame, (b) loadbearing walls, (c) foundations.

3. Damage caused by fire, tornado, hail, hurricane, acts of God, wars, riots, or civil commotion.

We, (Contractor), agree that should any leaks occur in the roofing system, we will promptly remedy said leaks in a manner to restore the roofing system to a watertight condition by methods compatible to the system and acceptable under industry standards and general practice.

We, (Contractor), further agree that for a period of 2 years from date of final acceptance referred to above we will make repairs, at no expense to the Owner, to any defects which may develop in the work, in a manner compatible to the system and acceptable under industry standards and general practice. Damage to the interior of the building resulting from failure of the roofing system described herein shall be repaired and/or replaced by the Contractor at no expense to the Owner.

IN WITNESS WHEREOF, we have caused this instrument to be duly executed, this _____ day of _____, 20___.

_____
(Contractor)

By:_____
(President)

WITNESS:

_____ (Notary Public)

My commission expires _____.

ASBESTOS FREE WARRANTY

Owner: _____

Location of Building: _____

Name of Building: _____

Date of Substantial Completion: _____

Know all men by these presents that we, _____
(Contractor, Subcontractor, Material Supplier, Equipment Manufacturer)

having furnished labor, materials, equipment and/or supplies; from, to and/or on _____

_____ as shown on the plans and specifications
(Buildings, etc.)

below under contract between _____ and
(Owner)

_____ and
(Contractor, Subcontractor, Material Supplier, Equipment Manufacturer)

dated _____:

warrant to Owner with respect to said work that no materials containing asbestos fibers were incorporated into the work, and that, to our knowledge and belief, no materials containing asbestos remain in or are covered by the work.

Exceptions: _____
(If there are no exceptions, state "No Exceptions" here)

IN WITNESS WHEREOF, we have caused this instrument to be duly executed, this the

_____ day of _____, 20___.

SWORN to and subscribed before me,
On this the ____ day of _____,
20___.

_____ _____
Company Notary Public

_____ _____
By: My Commission Expires:

_____
Title:

DOCUMENT 00500 – CONTRACT BETWEEN COUNTY OF GUILFORD AND PROVIDER

CONTRACT
COVER PAGE

NORTH CAROLINA

GUILFORD COUNTY

THIS CONTRACT is hereby made, entered into, and effective as of this _____ day of _____, 20___, by and between GUILFORD COUNTY, a body politic and corporate of the State of North Carolina, hereinafter referred to as the "COUNTY," and _____, a _____ **[insert type of entity: sole proprietorship, corporation, limited liability company, professional limited liability company, etc.]** with a place of business in _____, _____, **[insert city & state of company location]** hereinafter referred to as the "PROVIDER," and also collectively referred to as the "Parties."

W I T N E S S E T H :

WHEREAS, for the purpose and subject to the terms and conditions hereinafter set forth, the COUNTY hereby contracts for the items, goods, service or services of the PROVIDER and the PROVIDER agrees to provide the items, goods, service or services to the COUNTY in accordance with the terms of this Agreement.

WHEREAS, the COUNTY is in need of **[insert brief description of goods and/or services]** _____ _____; and,

WHEREAS, the PROVIDER has submitted a proposal to provide such goods and/or services.

NOW, THEREFORE, in consideration of promises mutually exchanged the Parties agree as follows:

1. Goods and/or Services. PROVIDER will provide the goods and/or services as set forth in the **Specifications (Attachment A)** and **Proposal (Attachment B)**, attached hereto and incorporated herein by reference. All items and/or services shall be provided in a competent, workmanlike and professional manner acceptable to the COUNTY. Should there be any discrepancy between the PROVIDER'S Proposal (Attachment B) and the Specifications (Attachment A) and/or the first ___ pages of this Contract, the first ___ pages of this Contract and/or the Specifications (Attachment A) shall prevail and control.

2. Pricing. As full compensation for the PROVIDER'S delivery of the goods and/or services, the COUNTY agrees to pay the amounts for the goods and/or services as set out in Attachment B. Payment will be made by the COUNTY to PROVIDER within thirty (30) days of receipt of a correct invoice and proper documentation that the goods and/or services have been delivered or provided in accordance with this Contract.

PROVIDER'S Base Bid $_____
Alternates $_____ (alternates, unit prices and schedule of values on attached sheet)
County's Contingency $_____
The maximum financial exposure to the COUNTY under this Contract will not exceed $_____.

3. Appropriation. This Contract is subject to annual appropriation of funds by the Guilford County Board of Commissioners or other funding source, pursuant to N.C.Gen. Stat. Chapter §153A-13.

4. Effective Date. The Notice to Procced will be issued by the GUILFORD COUNTY Facilities Department within approximately two (2) weeks of full execution of this Contract. The effective (starting) date of work to be performed under this Agreement will be set forth in the Notice to Proceed. The construction should be completed within _____ **[insert number of days, months or years]** from the date of the Notice to Proceed**.**

5. Addendum. The terms of this Agreement may only be modified or revised with a written Contract executed by both Parties.

6. Termination. The COUNTY may at any time and for any reason terminate PROVIDER'S services and work at the COUNTY'S convenience, after written notification to the PROVIDER via certified mail. Upon receipt of such notice, PROVIDER shall, unless the Notice directs otherwise, immediately discontinue the work and placing of orders for materials, facilities and supplies in connection with the performance of this Agreement.

Upon such termination, PROVIDER shall be entitled to payment only as follows; (1) the actual cost of the work completed in conformity with this Agreement and (2) plus such other costs actually incurred by PROVIDER as approved by the COUNTY. The amount of any payments made to PROVIDER prior to the date of termination of this Agreement shall be deducted from such sums as provided in this subparagraph.

7. Notices. All notices pursuant to this Agreement shall be in writing and delivered personally or mailed by certified mail, registered mail, postage prepaid, with return receipt requested, at the addresses appearing below, but each Party may change such address by written notice in accordance with this paragraph. Notices delivered personally will be deemed communicated as of actual receipt. Mailed notices will be deemed communicated as of three (3) days after mailing.

Marty K. Lawing
Guilford County Manager
GUILFORD COUNTY
P.O. Box 3427 (zip code 27402)
301 West Market Street
Greensboro, NC 27401

_____
President/Title
PROVIDER Co Name _____
PROVIDER Co Address _____
PROVIDER City State; Zip _____

8. Independent Contractor/Indemnification. PROVIDER shall operate as an independent contractor for all purposes. Nothing in this Agreement shall be interpreted or construed as creating or establishing the relationship of employer and employee between the COUNTY and either the PROVIDER or any employee or agent of PROVIDER. PROVIDER is an independent contractor and not an employee, agent, joint venture or partner of the COUNTY.

The Parties agree to each be solely responsible for their own acts or omissions in the performance of each of their individual duties hereunder, and shall be financially and legally responsible for all liabilities, costs, damages, expenses and attorney fees resulting from, or attributable to any and all of their individual acts or omissions to the extent allowable by law.

9. GUILFORD COUNTY LIABILITY INSURANCE REQUIREMENTS

WORKERS COMPENSATION
PROVIDER agrees to maintain coverage to apply for all employees for statutory limits in compliance with the applicable state and federal laws. The policy must include employer's liability with a limit of $1,000,000 for each accident, $1,000,000 for each employee, with a $1,000,000 aggregate policy limit.

COMMERCIAL GENERAL LIABILITY
PROVIDER does hereby agree to maintain minimum limits of $1,000,000 per occurrence, per location, single limit for bidily injury liability and property damage liability, with a $2,000,000 aggregate limit, per location. This shall include premises and/or operations, independent contractors, products and/or completed operations, broad form property damage and explosion, collapse and underground damage coverage, and a contractual liability endorsement.

BUSINESS AUTO POLICY
PROVIDER does hereby agree to maintain limits of $1,000,000 per accident combined single limit for bodily injury liability and property damage liability. This shall include: owned vehicles, plus hired and non-owned vehicles.

GUILFORD COUNTY shall be named as an additional insured on the PROVIDER'S general liability insurance policy, which shall be primary and n ot contrbutory to any other insurance that may be available to the county. PROVIDER will also secure its general liability insurance from an A rated insurance company acceptable to the COUNTY.

Upon the COUNTY'S offer of award of this Agreement, PROVIDER will provide Certificates of Insurance for meeting the required insurance provisions. **The Certificate of Liability statement shall state, "GUILFORD**

COUNTY is added as an additional insured as evidenced by the endorsement attached to this certificate." PROVIDER will also provide a copy of the additional insured endorsement to the COUNTY with their award package.

All insurance documents required under this Contract shall be forwarded to;

GUILFORD COUNTY
Attention: Risk Management
301 West Market Street Suite B-2
Greensboro, NC 27401
Reference: GUILFORD COUNTY CONTRACT NO. _____
With PROVIDER NAME

In the event PROVIDER fails to maintain and keep in force for the duration of this Contract the insurance required herein, the COUNTY may cancel and terminate this Contract without notice.

10. Assumption. If PROVIDER should undergo merger, acquisition, bankruptcy or any change in their ownership or their name for any reason, PROVIDER must immediately notify GUILFORD COUNTY in writing of these changes and provide the COUNTY with legal documentation supporting these changes, such as an Assumption Agreement, Bill of Sale, Articles of Incorporation, Articles of Amendment, sales contract, merger documents, etc. Further, PROVIDER will submit the name and address of the assuming PROVIDER'S registered agent for service of process and/or all notices required under this Contract.

11. Severability. If any provision of this Contract is held unenforceable, then such provision will be modified to reflect the Parties' intention. All remaining provisions of this Contract shall remain in full force and effect.

12. Force Majeure. Neither Party shall be liable to the other Party for any failure or delay caused by events beyond such Party's control and not due to its own negligence, provided that such Party uses commercially reasonable efforts to resume performance as soon as reasonably practicable. The non-performing Party shall notify the other Party of the force majeure event within twenty-four (24) hours of the onset thereof. In the event that a force majeure event precludes PROVIDER from performing services and/or providing goods for a period of ten (10) consecutive business days, the COUNTY shall have the right to: (a) procure replacement goods and/or services from an alternative source and/or (b) terminate the Contract or portion(s) of Contract upon written notice to PROVIDER.

13. Headings/Titles/Wording. Inclusion of titles of paragraphs or section headings, capitalization of certain words or phrases and/or bold face typestyle of certain words or phrases in this Contract are for convenience purposes only and shall not be used to interpret or construe the provisions of this Agreement. The terms "Contract" and "Agreement" have the same meaning and may be used interchangeably throughout this document. The terms "Attachment" and "Exhibit" have the same meaning and may be used interchangeably throughout this document.

14. Entire Agreement. This Contract, including the Exhibits and/or Attachments, if any, sets forth the entire Agreement between the Parties. All prior conversations or writings between the Parties hereto or their representatives are merged within and extinguished. This Contract shall not be modified except by a writing subscribed to by all the Parties.

15. Jurisdiction. The Parties agree that this Contract is subject to the jurisdiction and laws of the State of North Carolina. The CONTRACTOR will comply with bid restrictions, if any, and applicable laws, including N.C. Gen. Stat. §143-129(j) regarding E-Verify. Any controversies arising out of this Contract shall be governed by and construed in accordance with the laws of the State of North Carolina. An Affidavit Regarding E-Verify is attached hereto and incorporated herein by reference as **Exhibit I.**

16. Iran Divestment Act of 2015. Whereas, N.C. Gen. Stat. §147-86.59 requires that a State agency or political subdivision of the State must require persons attempting to contract therewith, including contract renewals or assumptions, to certify that the person or the assignees are not identified on the list created by State Treasurer pursuant to N.C. Gen. Stat. §147-86.58. Effective as of the date of this Contract, and in accordance with N.C. Gen. Stat. §147, Article 6E entitled "Iran Divestment Act," each Party hereby certifies that it is not identified on the Final

Divestment List created by the State Treasurer, which list of persons the Treasurer has determined engage in investment activities in Iran, including any subcontractors of eith Party.

WITNESS the following signatures and seals all pursuant to authority duly granted, effective as of the day and year first above written.

GUILFORD COUNTY

_____
Marty K. Lawing, Guilford County Manager

ATTEST:

_____
Guilford County Clerk to Board

(COUNTY SEAL)

[Insert PROVIDER'S legal name. – This should match with their name in the introductory paragraph of this contract.]

_____
President

Printed Name:_____

ATTEST:

_____
Corporate Secretary

Printed Name: _____

(CORPORATE SEAL)

or

No Corporate Seal Exists:

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act.

_____
Guilford County Finance Director

Guilford County's General Terms and Conditions

1. This bid package serves as official notice that GUILFORD COUNTY is soliciting and will receive bids for the item(s) and/or service(s) stated on the event cover page and outlined in the bid specifications. Bids shall be submitted by mail or hand delivered to the location named in the solicitation or electronically via www.myguilford.com by the event close date and time specified in the bid package.

2. All addenda to this bid package will be issued electronically. No oral changes made by anyone shall affect this bid package.

3. The official bid price, quote, and response for the RFP, RFQ, or otherwise instructed; shall be signed by a duly authorized person acknowledging full understanding of the bid information and all addenda. The signature shall be witnessed and the Corporate Seal affixed if a corporation. The exact legal name of the corporation or other entity shall be provided.

4. Price quote(s) shall be net, and include all discounts and delivery charges to GUILFORD COUNTY. In cases of difference(s) between unit price and total price, unit price shall prevail unless otherwise noted.

5. Items and services bids are for delivery or completion as soon as possible unless otherwise stated. Delivery or completion dates could therefore be important in making the final determination of award.

6. State and local sales taxes are to be included in quotes, but they are to be shown as a separate line item for payment. Federal (sales-excise) taxes, where applicable, are to be included in quotes as they are part of the purchase price.

7. All Formal Bids will be publicly opened and recorded at the date and time specified by and in the Purchasing Department. It is GUILFORD COUNTY'S policy to announce the award electronically. All other information, except that specifically noted by the Supplier as being of a **Confidential** nature, becomes public record in accordance with N.C. GS 132 and other applicable North Carolina laws. All interested parties are invited to attend any Formal Bid opening.

8. All Informal Bids will **NOT** be publicly opened and recorded at the date and time specified by and in the Purchasing Department. It is GUILFORD COUNTY'S policy to announce the award electronically. All other information, except that specifically noted by the Supplier as being of a **Confidential** nature, becomes public record in accordance with N.C. GS 132 and other applicable North Carolina laws after the award is made.

9. GUILFORD COUNTY will have a period of thirty (30) days, unless otherwise stated, after opening the bid package to analyze and award to the lowest responsive and responsible bidder taking into account; service, quality, delivery date, past performance and price. At that time, the successful vendor shall promptly enter into a contract acceptable to GUILFORD COUNTY.

10. Events/Bids that exceed $90k for the purchase of apparatuses, supplies, equipment, and/or services and construction or construction repair contracts(greater than $500,000) require final approval of the GUILFORD COUNTY Board of Commissioners who normally meet in open session two (2)times each month, the first and third Thursdays at 5:30pm in Old County Courthouse. Everyone is invited to attend those meetings. Note: Other contracts may in the sole discretion of the County, may require Board of County Commissioners Approval.

11. A bid bond or deposit may be required for Construction or repair contracts (at least 5% of bid amount, Formal Bids ($500,000 and above) and for Purchase contract it is not required. If this is the case, it will be clearly stated in the Event specifications for each bid package. If a bid deposit is required, it should be submitted in the form of cash, cashier's check, certified check, or bid bond. The checks shall be drawn on a bank or trust company insured by the Federal Deposit Insurance Corporation; and bond shall be a corporate surety licensed under the State of North Carolina. The oblige in either check or bond shall be GUILFORD COUNTY. In addition to the bid deposit or bid bond, some bids may require a separate performance bond and/or payment bond as provided by law in the amount of the contract by the awarded vendor(s). Construction or repair contracts (100% of contract amount (each contract over $50,000 of project costing over $300,000 - G.S. 143-129(c); G.S. 44A-2; Purchase Contracts it is not a requirement. If this is required, it will be clearly stated in the bid specifications. In place of a bond; cash, cashier's check, certified check or government securities shall be acceptable.

12. If bid deposit checks are received, they will be returned to all suppliers when the successful supplier has been awarded a contract by GUILFORD COUNTY. The successful vendor's deposit check will be returned when the required contract has been executed.

13. GUILFORD COUNTY'S MWBE participation goal is 10% in accordance with N.C.G.S. 143-28.2(e) (3) and 143-129(b). This 10% percent is a goal, and is not a requirement, demand, set aside or guarantee to minority/women businesses.

14. GUILFORD COUNTY reserves the right to reject any and all bids if it is in the best interest of the County.

15. In case of default by the vendor, GUILFORD COUNTY shall retain the bid deposit or call upon the bid bond surety unless otherwise provided by law.

16. GUILFORD COUNTY'S policy is Net 30 days upon completion and acceptance. In the case of some longer term projects, GUILFORD COUNTY may choose to release partial payments to the vendor each month based on 90% of the estimated value of work completed. The final payment will be released within thirty (30) days or less after the satisfactory completion of all work, its acceptance by GUILFORD COUNTY, and the settlement of all other claims and accounts.

17. In the case of continuing service type contracts, payment(s) will be made monthly or as otherwise agreed upon.

18. It is GUILFORD COUNTY'S policy to conduct all purchasing within the North Carolina State Laws and Guilford County Purchasing Policy. To provide each vendor/supplier an equal opportunity to participate and to award on a best value basis. In order to accomplish our policy, we intend to make every vendor/supplier aware of each purchasing opportunity. Contracts shall be awarded to the lowest responsive and responsible bidder(s) based on quality, past performance, and the time specified in the proposal of the contract. Vendors/suppliers should register online for bidding opportunities at: www.myguilford.com/purchasing

19. A Material Safety Data Sheet (MSDS) shall be furnished to GUILFORD COUNTY for any/all products purchased that contain hazardous material and/or components.

20. Any vendor/supplier performing work on GUILFORD COUNTY's property is required to have and maintain adequate Liability and Worker's Compensation Insurance as laid out in the bid package that will fully protect GUILFORD COUNTY from any damages to property and/or persons caused by the vendor/supplier.

21. The successful supplier/vendor shall be required, and is responsible, to take Affirmative Action to employ Disabled Veterans and Veterans of the Vietnam era, including listing vacancies with the North Carolina Employment Security Commission, under 42 US Code 4212 and applicable regulations thereafter.

22. The successful vendor/supplier shall be required, and is responsible, to take Affirmative Action in complying with all Federal and State requirements concerning fair employment without regard to discrimination by reason of race, color, religion, sex, national origin or physical handicap.

23. The successful vendor/supplier shall be required to employ in the workforce only those laborers whose employment is consistent with all applicable State and Federal Laws including E-Verify requirements. The successful vendor/supplier, and each subcontractor, shall prior to performance of the work, receive clear written evidence from each laborer, that said laborer may lawfully be employed. Said evidence shall immediately be submitted to the County. Failure of said vendor/supplier or subcontractor to receive, retain and/or provide to the County such evidence shall constitute a material breach of the contract with the County.

24. The successful vendor/supplier is responsible for compliance with all applicable Local, State, and Federal laws, including all state and local permits, licenses and fees.

25. If the vendor/supplier should undergo merger, acquisition or any change in their ownership or their name for any reason, the provider shall immediately notify GUILFORD COUNTY in writing of these changes and provide GUILFORD COUNTY with legal documentation supporting these changes such as an Assumption Agreement, Bill of Sale, Articles of Incorporation, Articles of Amendment, sales contract, merger documents, etc. Further, the vendor/supplier shall submit the name and address of their registered agent for service of process and/or all notices required under the contract(s). This contract shall not be assumed or otherwise transferred to another party by the vendor/supplier without the express written consent of GUILFORD COUNTY, which said consent will be evidenced by acceptance memo, letter or email from the GUILFORD COUNTY MANAGER or his designee to the original vendor/supplier under the contract and the assuming vendor/supplier.

26. Provider shall operate as an independent vendor/supplier for all purposes. The parties agree to each be solely responsible for their own acts of omissions in the performance of each of their individual duties hereunder, and shall be

financially and legally responsible for all liabilities, costs, damages, expenses and attorney fees resulting from or attributable to any and all of their individual acts or omissions to the extent allowable by law.

27. **Iran Divestment Act of 2015.** In accordance with N.C.G.S. §143C-6A-5 and other applicable sections of N.C.G.S. §143C-6A regarding the Iran Divestment Act of 2015, each Party hereby certifies that it is not identified on the State Treasurer's list of persons which the Treasurer has determined engage in investment activities in Iran, including any subcontractors of either Party.

28. This contract and all other related agreements are governed by the Laws of Guilford County in the State of North Carolina.

Guilford County Law Enforcement Center
401 W. Sycamore Street, Greensboro, NC 27401
Guilford County Law Enforcement Center Renovation

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

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DOCUMENT 00821 – SUPPLEMENTARY GENERAL CONDITIONS OF THE CONTRACT

Article 1 Scope

This section of the Contract defines the Supplementary General Conditions governing the performance of the Contract between the OWNER and the Contractor (collectively, the "Parties").

Article 2 Definitions

A. ADDENDA (AMENDMENT, paragraph 5 of the Contract): Any written or graphic instrument issued prior to the opening of bids which clarifies, corrects, or changes any part of the bidding documents or the Contract Documents.

B. AS BUILT DRAWINGS: Detailed drawings that accurately and clearly indicate in detail the actual Work performed on the Project.

C. CHANGE DIRECTIVE – A written order to the Contractor signed by the Owner directing an addition, deletion, or revision in the Work after execution of the Construction Agreement, in circumstances when the parties have been unable to agree on an adjustment to the Contract Price or the Contract Time, but the Owner requests that the Contractor proceed with said Work subject to adjustment of the Contract Price and/or Contract Time under the procedures described herein.

D. CHANGE ORDER - A written order to the Contractor signed by the Owner and the Designer authorizing an addition, deletion, or revision in the Work and/or an adjustment in the Contract Price and/or the Contract Time issued after execution of the Construction Agreement.

E. COMPLETION DATE - Those dates identified as Completion Dates in the Contract Construction Schedule or elsewhere in the Contract Documents.

F. CHANGE OF CONTRACT: A written order, issued after the effective date of the Contract, and executed by the OWNER and Contractor, which authorizes an addition, deletion or revision in the Work and which may include an adjustment in the Contract Sum or the time of performance of the work. Construction Manager(s) - The person or firm designated as the Construction Manager in the Contract Documents, or their authorized representatives. The Construction Manager(s), as referred to herein, will be referred to hereinafter as if each were of the singular number, masculine gender.

G. CONSTRUCTION PROGRESS SCHEDULE: The Construction Progress Schedule or Schedule.

H. CONTRACT: That certain document (of which these General Conditions are a part), and all of its schedules, exhibits and subsequent amendments, which defines the scope of the Contractor's Work and specifies the Contract Sum.

I. CONTRACT DOCUMENTS: The Contract Documents are as defined in the Contract between the OWNER and the Contractor. The Contract Documents shall include all other documents issued after execution of the Contract, including, without limitation, Changes of Contract, Change Directives and contract modifications that are intended to bind the Parties hereunder. All of the documents that make up the Agreement, plus the Drawings and Specifications that describe the scope of the Work, plus allowable Modifications to the Contract Documents.

J. CONTRACT TIME - The number of calendar days stated in, or computed from, the Contract Documents for the completion of the Work, or any portion thereof. The contract time is in consecutive calendar days, beginning on the date of the Commencement as specified in the written Notice-to Proceed.

K. CONTRACT SUM: The total monies payable to the Contractor under the Contract Documents pursuant to paragraph 15.1 of the Agreement.

L. CONTRACTOR: The entity that executed the Contract and is identified therein, which has agreed to assume the responsibility of undertaking the execution of the Work under the terms of the Contract Documents and to be liable for the acceptable performance of the Work and for the payment of all legal debts pertaining thereto. The term Contractor also means the Contractor's representative.

M. DAY: Unless otherwise specified, the words "day" or "days" shall mean calendar day or calendar days.

N. DRAWINGS: The Drawings are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location, and dimensions of the Work, and generally including plans, elevations, sections, details, schedules and diagrams. Drawings may also be referred to as "Plans".

O. FINAL PAYMENT: shall follow Guilford County Policy per Guilford County's General Terms and Conditions article 15. The point at which the Contractor has, as determined by the Owner, completed the Work, with the exception of guaranty and warranty obligations, and becomes entitled, upon the recommendation of the AE and determination by the Owner, to receive final payment.

P. FINAL PUNCHLIST: shall have the meaning set forth in Paragraph 9.D.

Q. FORCE MAJEURE: Shall have the same meaning set forth in paragraph 11 of the Contract.

R. The words "furnish," "furnish and install," "install," and "provide" or words with similar meanings shall be interpreted, unless otherwise stated, to mean furnish and install complete, in place and ready for service.

S. HAZARDOUS MATERIALS: Any substance or material containing one or more of any of the following: "hazardous material," "hazardous waste," "hazardous substance," "regulated substance," "petroleum," "pollutant," "contaminant," "polychlorinated biphenyls," "lead or lead-based paint" or asbestos" as such terms are defined in any applicable federal, state and local laws, rules and regulations (now or hereafter in effect) dealing with the use, generation, treatment, storage, disposal or abatement of hazardous materials.

T. LAW(S): All federal, state, local or quasi-governmental laws, statutes, ordinances, codes, orders, rules, restrictive covenants, regulations and other requirements applicable to performance of the Work or construction or operation of the Project, including, without limitation: building codes; environmental laws; social security and unemployment compensation laws; workers' compensation laws; safety laws; archaeological and paleontological preservation laws; requirements of local utility companies and of local and national fire protection associations; zoning and setback or other locational requirements of applicable Laws; the Americans with Disabilities Act; and federal, state and local employment laws. Laws shall also include any covenants, conditions or restrictions applicable to or affecting the Project or the Site.

U. LIQUIDATED DAMAGES – The Liquidated Damages is the amount stipulated in the Supplementary General Conditions per day per Prime Contractor as Liquidated Damages reasonably estimated in advance to cover the losses to be incurred by the Owner by reason of failure of said Contractor(s) to complete the Work within the time specified, such time being in the essence of this contract and a material consideration thereof.

V. OWNER: County of Guilford, its successors and assigns (including any person designated by the OWNER International as a Project representative), acting as agent for the OWNER for purposes of administering the Contract.

W. MODIFICATION: (1) a written amendment to the Contract signed by both parties which clarifies, revises or changes the Contract Documents, (2) a Change of Contract or Change Directive or (3) any written

interpretation, clarification or amplification issued by the OWNER pursuant to the terms hereof.

X. NOTICE TO PROCEED: A written notice given by the OWNER to the Contractor fixing The Date of Commencement on which Contractor shall start to perform Contractor's obligations under the Contract Documents.

Y. PRODUCT DATA: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams or other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.

Z. PROJECT: The total construction of which the Work performed under the Contract Documents may be the whole or a part.

AA. REQUEST FOR INFORMATION (RFI): A written communication from the Contractor to the AE for any interpretation of, or information needed, required, or desired under the Contract Documents. The Owner reserves the right to determine the reasonable format and contents required for a Request for Information. In any Request for Information, the Contractor shall state a reasonable date by which a response is necessary in order to avoid delay in progress on the Work and shall make such request sufficiently in advance of such date as to avoid any such delay. The AE shall respond in writing to the Request for Information by the date stated by the Contractor unless he cannot reasonably do so, in which case he shall prior to that date notify the Contractor of the date by which he can reasonably respond. The Contractor shall not be entitled to any additional time for the completion of the Work or any portion thereof by reason of the AE's failure to respond.

BB. SHOP DRAWINGS: Drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the Work required by the Contract Documents.

CC. SITE: The physical area where the Work is to be done.

DD. SPECIAL PROVISIONS: That part of the Contract Documents which amends or supplements these General Conditions and other requirements of the Contract Documents.

EE. SPECIFICATIONS: Those portions of the Contract Documents consisting of written technical descriptions, provisions or requirements pertaining to the materials and workmanship applicable to the Work to be performed under the Contract Documents, including, but not limited to, the quantities or quality of materials, equipment, construction systems or applications.

FF. SUBCONTRACTOR: Any person or organization having a direct contract with the Contractor (or any wholly owned or affiliated entity thereof) to perform a portion of the Work or provide materials for the Project.

GG. SUBMITTALS: Shop drawings, product data, samples, and other documents required by the Contract Documents to be submitted by the Contractor to the AE.

HH. SUBMITTAL REGISTER: Submittal Register is a listing all Submittals the Contractor is required to make or proposes to make under the Contract Documents with the dates on which the Contractor proposes to make such Submittals and the dates by which the Contractor reasonably requires a response from the Designer with respect to each Submittal.

II. SUBSTANTIAL COMPLETION: The completion of the Work to the point that (i) the OWNER, in its reasonable judgment, can use the Project for its intended use, (ii) the Project has been issued a permanent certificate of occupancy or a temporary certificate of occupancy where a permanent certificate of occupancy can reasonably be obtained upon completion or correction of minor Work and (iii) the Work

has been completed except for those items specifically identified in the Final Punch list. (iv) All operations and maintenance manuals, Owner training, and as-built drawings must be submitted prior to Substantial Completion being achieved.

JJ. SUPPLIER: Any party supplying, by sale or lease, directly or indirectly, any materials or construction equipment for the Contractor's Work and includes distributors, material men, vendors and manufacturers.

KK. UNIT PRICE: The standard, uniform price which the Contractor has provided for a specific item or type of Work which may be required for the Project. A Unit Price constitutes the Contractor's entire compensation for performing that item of Work.

LL. WORK: As farther described in the Contract Documents, all construction and other services necessary to complete the Project as required by the Contract Documents, except to the extent specifically indicated to be the responsibility of the OWNER or others, and includes all labor, materials, equipment, supplies, permits, licenses and services provided or to be provided by the Contractor to fulfill its obligations. The Work may constitute the whole or part of the Project.

Article 3 Execution, Correlation And Intent Of Documents

A. COMPLEMENTARY: Throughout the Contract Documents, various requirements have been specified for performance by the Contractor. Each such Contract item is mandatory and shall be performed by the Contractor. Contract Documents are complementary and shall be used as a whole and not separately. If any item of the Work is shown on any of the Contract Documents, it shall be executed and is binding as if shown and contained on all Contract Documents.

B. ORDER OF PRECEDENCE: If any portion of the Contract Documents conflict with any other portions, the following order of precedence shall control:

1. Modifications to the Contract
2. Contract between the OWNER and Contractor (including Exhibits and Schedules thereto);
3. Addenda to the Contract;
4. Special or Supplementary Conditions;
5. General Conditions;
6. Scope of Work;
7. Modifications to the Specifications;
8. Addenda to the Specifications;
9. Specifications;
10. Modifications to the Drawings;
11. Addenda to the Drawings;
12. Drawings, in the following order of precedence;
    a) Notes on Drawings;
    b) Large-scale Drawings;
    c) Large-scale details;
    d) Small-scale Drawings;
    e) Small-scale details;
    f) Figured dimensions;
    g) Scaled dimensions;
13. All other documents, terms and conditions of the Contract;
14. If any uncertainty remains after reference to the above precedence, the Contractor will then confer with and be governed by the interpretation(s) of the OWNER.

C. INTEGRATION CLAUSE: The Contract Documents constitute the entire agreement between the Parties and supersede all previous discussions, negotiations, agreements and understandings with respect to the subject matter hereof No verbal agreement or conversation with any officer, agent or employee of the OWNER or Contractor, either before or after the execution of the Contract, shall affect or modify any of the terms or obligations in the Contract Documents. The Contract Documents may only be changed in writing as specified herein.

D. REFERENCED SPECIFICATIONS AND STANDARDS: Where standard specifications issued by a recognized industry association or regulatory body are referenced, the reference shall be interpreted as incorporating the standard specifications in total unless otherwise noted in the Contract.

E. INTENT OF CONTRACT DOCUMENTS: It is the intent of the Specifications and Drawings and other Contract Documents to describe a complete Project in accordance with the Contract Documents. Where the Contract Documents describe portions of the Work in general terms, but not in complete detail, the best general practice shall be followed and only new materials and workmanship of best standard quality shall be used unless otherwise directed. Omissions from the Contract Documents or the inadequate description of details of the Work which are manifestly necessary to carry out the intent of the Contract Documents, or which are customarily performed, shall not release the Contractor from performing such necessary or customary details of the Work at no extra cost to the OWNER. In general, the Drawings shall be considered as establishing location, quantity and relationship of materials and the Specifications shall be considered as defining type and quality of materials and workmanship requirements. The requirements for the greatest quantity and the highest quality to be interpreted from those documents shall govern. All questions regarding the Drawings and Specifications and the interpretation thereof and the resolving of conflicts or inconsistencies contained therein shall be determined by the OWNER upon written request from Contractor.

F. The Work of all trades under the Contract Documents shall be coordinated by the Contractor in such a manner as to obtain the best workmanship possible for the entire Project and all components of the Work shall be installed or erected in accordance with the best practices of the particular trade.

Article 4 Contractor's Representations

A. CONTRACTOR REPRESENTATIONS: By executing the Contract, the Contractor represents and warrants that it has had ample opportunity to, and by careful examination has, satisfied itself as to the nature and location of the Work, the conditions of the Site(s), the character, quality, and quantity of the materials to be encountered, the equipment and facilities needed preliminary to and during the prosecution of the Work, the general and local conditions, including weather, and all other matters which can in any way affect the Work under the Contract Documents, and has, as necessary, consulted with the OWNER 's architect or other consultants to obtain any and all clarifications necessary to establish the Contract Sum and the time for performance of the Work.

B. REVIEW OF CONTRACT DOCUMENTS: Contractor further warrants that it has reviewed the Contract Documents and acknowledges and declares they are adequate, full, complete and correct, are sufficient to have enabled the Contractor to determine the cost of the Work therein and that the Drawings, the Specifications, and all Modifications and Addenda are sufficient to enable the Contractor to construct the Work outlined therein in accordance with applicable Laws and otherwise to fulfill all its obligations hereunder. The Contractor shall not proceed with the Work if any error, omission or inconsistency appears within the Contract Documents, but shall immediately submit a written request for an explanation or decision to the OWNER. Should Contractor proceed without a written response by the OWNER, it shall do so at its own risk and expense.

C. DIFFERING SITE CONDITIONS: Contractor understands and acknowledges that any hazardous material report(s) it has received from the OWNER concerning the Project Site are for informational purposes only, that the OWNER does not warrant the contents or accuracy of such report(s). Contractor represents that it

shall verify the report prior to commencement of the Work. Contractor shall be solely responsible for any concealed or unknown conditions. The presence of such concealed or unknown conditions shall not be the basis for any extension of time or adjustment in the Contract Sum.

D. BUSINESS AND FINANCIAL DOCUMENTAION: Contractor shall provide the OWNER with Contractor's (i) contractor license, (ii) business license and (iii) other business or professional documentation reasonably requested by the OWNER. In the event that any of the foregoing documents expire during the term of this Contract, Contractor shall provide the OWNER with evidence that such documents have been renewed. Upon request by the OWNER, Contractor shall also provide the OWNER with all financial documentation and information reasonably requested by the OWNER, including, without limitation, AIA Document A305 (Contractor's Qualification Statement) and audited financial statements. To the extent Contractor has provided the foregoing documents and information to the OWNER prior to execution of the Contract, Contractor shall update such documentation and information as reasonably requested by the OWNER.

E. SUPERINTENDENT: The Owner shall have the right to approve the Contractor’s project superintendent proposed for this project and shall have the right to require removal of the Contractor’s key personnel from the job site if their performance is not satisfactory.

Article 5 Contractor’s Duties And Responsibilities

A. The Contractor shall supervise and direct its portion of the Work using its best skill and attention. The Contractor shall be solely responsible for all construction means, methods, techniques, sequences and procedures, and for coordination of all portions of the Work under its Contract. All Work performed pursuant to the Contract Documents shall conform in all respects to the North Carolina State Building Code and all other state, local, and national codes in effect at the time of and applicable to this Work.

B. The Contractor shall be responsible to the OWNER for the acts and omissions of its employees, subcontractors, and their agents and employees, and other persons performing any of the Work under a contract with the Contractor.

C. The Contractor shall provide, pay for and maintain all labor, materials, equipment, tools, machinery and services necessary for the proper execution and completion of the Work. All materials and equipment furnished by the Contractor shall be new, free from faults and defects, of good quality, and conform to the requirements of the Contract Documents.

D. The Contractor shall not be relieved from its obligations to perform Work in accordance with the Contract Documents either by the activities or duties of the OWNER in the administration of this Contract, or by inspections, tests, acceptances, or approvals required or per-formed by persons other than the Contractor.

E. In performing its obligations hereunder, Contractor shall, at a minimum, conform to the standards of other professional contractors performing similar work in the locale in which the Project is located.

F. The Contractor shall, prior to commencement of the Work, submit to the OWNER, for its approval, the name and experience resume of Contractor's proposed project manager and/or superintendent. The Contractor shall also submit the names of key members of its firm who will be directly connected with the Project and outline the duties and authority of each.

G. The Contractor shall have at the Project site, during the full term of the Contract, an approved, competent, full-time superintendent fluent in the English language, and any necessary assistants, all satisfactory to the OWNER. Contractors' superintendent shall represent the Contractor and all directions given such superintendent by the OWNER shall be as binding as if given to the Contractor. The Contractor shall at all times enforce strict discipline and good order among its employees and

shall not employ on the Work any unfit person, anyone not skilled in the work assigned to him or her and anyone who is not satisfactory to the OWNER.

H. Contractor acknowledges that the OWNER's consultants (including, without limitation, its architect) do not have the authority, either explicit or implied, to act on behalf of the OWNER to approve, disapprove, accept or reject any documentation, submission, request or proposal submitted by Contractor, unless and only to the extent that the OWNER has in writing authorized such consultant to perform the foregoing.

I. All correspondence from Contractor to the OWNER shall identify the OWNER's project number and name.

J. The Contractor shall provide sufficient competent and suitably qualified personnel, equipment, and supplies to lay out the Work and perform construction as required by the Contract Documents. The Contractor will at all times maintain good discipline and order at the site and will comply with all applicable OSHA standards.

K. Any person employed by the Contractor, any Subcontractor, or any sub-subcontractor who, in the opinion of the Designer or the Owner, does not perform his Work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Owner or Designer, be removed forthwith by the Contractor, Subcontractor, or sub-subcontractor employing such person without cost to the Owner, and shall not be employed again in any portion of the Work without the written approval of the Owner or Designer.

L. Should the Contractor fail to remove such person or persons or fail to furnish suitable and sufficient personnel for the proper prosecution of the Work within three (3) days after written order, the Owner may withhold further payment by written notice until compliance with such order.

M. When the methods and equipment to be used by the Contractor accomplishing the Work are not prescribed in the Contract Documents, the Contractor shall be free to use any methods or equipment that will accomplish the Work in conformity with the requirements of the Contract Documents.

N. The Contractor shall attend job progress conferences and all other meetings or conferences as directed by the Designer. The Contractor shall be represented at these job progress conferences by a representative having the authority of the Project Manager and by such other representatives as the Designer may direct. Job progress conferences shall be open to Subcontractors, suppliers and any others who may contribute beneficially toward maintaining required job progress, and such personnel shall be encouraged by the Contractor to attend. It shall be the principal purpose of job progress conferences to effect coordination, cooperation and assistance in every practical way toward the end of maintaining progress of the Project on schedule and to complete the Work and the Project by the specified Completion Dates. The Contractor shall be prepared to assess progress of the Work as required in the Contract Documents and to recommend remedial measures for correction of progress as may be appropriate. The Designer shall preside as chairman and arrange for minutes to be taken and circulated.

O. The Contractor shall pay all license fees and royalties, and assume all costs incident to the use of any invention, design process, or device which is the subject of patent rights or copyrights held by others, except for inventions, design processes, or devices specified by the Designer in the Contract Documents. The Contractor shall indemnify and hold harmless the Owner, the Designer, and anyone directly employed by either of them, from and against all claims, damages, losses and expenses, including attorney's fees and costs of defense, arising out of any infringement or alleged infringement of such rights during or after completion of the Work, and shall defend all such claims in connection with any actual or alleged infringement of such rights.

P. The Contractor shall secure and pay for all permits, including without limitation construction permits and licenses, and will pay all governmental charges and inspection fees necessary for the prosecution of the Work.

Q. The Contractor shall give all notices and comply with all laws, ordinances, rules, and regulations applicable to the Work and shall protect and indemnify the Owner and the Owner's officers, agents, or

servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor or by the Contractor's employees, Subcontractors, sub-subcontractors, or their employees.

R. The Contractor shall indemnify and hold the Owner, the Designer, the Designer's consultants, and their officers, agents, and employees harmless against all costs, damages, and expenses, including attorney's fees and costs of defense, arising out of claims by any separate contractor or by any Subcontractor, sub-subcontractor, or supplier engaged by or employed by the Contractor or employed by any of the Subcontractors claiming through him, including without limitation damages, losses, and expenses arising out of or relating to any inconvenience, delay, interference, or other action or non-action of the Contractor or the Contractor's Subcontractors on the Project.

S. Any land disturbing activity performed by the Contractor in connection with the Project shall comply with all erosion control measures set forth in the Contract Documents and any additional measures which may be required in order to ensure that the Project is in full compliance with the Sedimentation Pollution Control Act of 1973, as implemented by Title 15 North Carolina Administrative Code, Chapter 4, Sedimentation Control, Subchapters 4A, 4B and 4C, as amended (15 NCAC 4A, 4B, and 4C), and as may be revised or amended in the future. Upon receipt of notice that a land-disturbing activity is in violation of said Act, the Contractor shall be responsible for ensuring that all steps or actions necessary to bring the Project in compliance with said Act are promptly taken. The Contractor shall be responsible for all penalties assessed pursuant to N.C. Gen. Stat. 113A-64 with respect to its Work, and shall indemnify and hold harmless the Owner from all costs and expenses, including attorney's fees and costs of defense arising out of or related to the enforcement of the Act against any party or person described in this Article.

Article 6 Substitutions

A. SUBSTITUTION: The Contractor may offer a substitution of a specified or indicated method if it presents to the OWNER complete information concerning the substitution and the benefits thereof to the OWNER by reason of lower cost or improved performance, or both, over the specified or indicated method. However, such submission of a proposed substitution does not relieve the Contractor from its obligations under the Contract. In proposing a substitution, the Contractor warrants that the substitution is, at a minimum, equivalent in performance to the specified or indicated item. A substitution shall not be effective unless accepted in writing by the OWNER. Unless expressly authorized in writing by the OWNER, the OWNER's consultants do not have the authority to approve proposed substitutions.

B. ADDITIONAL COST AND TIME: Any additional costs and time and changes to the Work (including, but not limited to the work of other contractors and additional design costs which may be affected thereby) which may result from the proposed substitution shall be disclosed at the time the substitution is proposed to the OWNER. Changes to the Work and any additional costs or time there from which are not disclosed in advance to the OWNER shall be the sole responsibility of the Contractor and shall not increase the Contract Sum or the time for performance of the Work. All redesign costs incurred by reason of an approved substitution shall be paid by the Contractor.

C. APPLICATION: Requests for review of substitute demolition methods will not be accepted by the OWNER from anyone other than the Contractor. If the Contractor wishes to furnish or use a substitute demolition method, the Contractor shall make written application to the OWNER in accordance with specification.

D. REPRESENTATIONS: By submitting an application pursuant to Paragraph 7(D), the Contractor:

1. Represents that it has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
2. Represents that it will provide the same warranty for the substitution as the original product specified;
3. Certifies that the cost and schedule data presented is complete and includes all related costs and schedule adjustments under the Contract Documents, and waives all claims for additional

costs and schedule adjustments related to the substitution which subsequently become apparent; and

4. Agrees to coordinate the installation of the accepted substitute, making such changes as may be required for the work to be complete in all respects.

E. UNAPPROVED SUBSTITUTIONS: The OWNER reserves the right to reject any unapproved substitution without explanation or formality, and to require the replacement of an unapproved substitution with the specified and/or indicated items at no expense to the OWNER, and to require compensation to the OWNER for loss of use time during replacement.

Article 7 Submittals

A. SUBMITTALS: Upon the earlier of: (1) the execution of the Contract; or (2) receipt of a Notice to Proceed, the Contractor shall immediately begin developing all Submittals required by the Contract Documents. The Contractor shall submit to the Designer within fourteen (14) days all Submittals required by the Contract Documents. The Contractor shall submit three (3) reproducible prints of all shop drawings plus the number of copies sufficient for his requirements. The Contractor shall submit samples in quantities required by the Contract Documents. The Contractor shall submit product data in five (5) copies, plus the number of copies sufficient for the Contractor's requirements. Each item submitted shall be thoroughly reviewed by the Contractor and shall include a stamp or note describing the Contractor's action signed by the person authorized by the Contractor to conduct the review with that person's name clearly printed. Submittals shall be submitted in such time as to cause no delay to the Work or any part thereof and in accordance with the Contract Construction Schedule and Submittal Register. The Designer shall review the submittal with reasonable promptness, noting desired corrections, if any. The Designer shall retain two (2) copies of the submittal and shall return the balance of the reviewed submittal to the Contractor for action. The Contractor shall furnish any corrected submittal to the Designer. The Designer shall retain two (2) copies of the corrected submittal and will return the balance of the reviewed submittal to the Contractor.

B. CONTRACTOR REVIEW: Contractor shall review each submittal for completeness, conformance to the Contract Documents and coordination with other parts of the Work and the Construction Progress Schedule. By providing and submitting to the OWNER or, if otherwise specified in the Contract Documents, to the OWNER 's designee, Shop Drawings, Product Data, warranties and Samples, the Contractor will be deemed to represent that it has determined and verified (1) the availability of all materials, and (2) field measurements and field construction criteria related thereto, and that it has checked and coordinated the information contained within such Submittals with the requirement of the Work, the Contract Documents and the Construction Progress Schedule and that such Shop Drawings, Samples, warranties and Product Data conform to the Contract Documents.

C. APPROVAL: Contractor shall not proceed to perform Work related to a Submittal until the Submittal has been approved by the OWNER (for purposes of this Article 7, approval by the OWNER's designated consultants shall be deemed to be approval by the OWNER); such Work shall thereafter be performed in accordance with the Contract Documents and the approved Submittal.

D. INCOMPLETE SUBMITTALS: The OWNER may return incomplete Submittals with no action taken. The Contractor shall have no claim for any damages or for an extension of time due to delay in the Work resulting from the rejection of materials or from the rejection, correction, and resubmittal of Shop Drawings, Samples and Product Data, or from the untimely submission thereof

E. ACCEPTANCE: Acceptance by the OWNER is for general demolition intent only. Quantities, size, field dimensions and locations are some of the required characteristics which are not part of the OWNER's acceptance and will not be checked. Accordingly, the OWNER's limited acceptance shall in no way relieve the Contractor from its obligation to conform its Work to required characteristics, to Project specifications and to the Contract Documents. Review of submittal by the Designer shall not be construed as relieving

the Contractor from responsibility for compliance with terms or designs of the Contract Documents nor from responsibility for errors of any sort in the submittal.

F. DEVIATIONS: The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the OWNER's approval of Submittals, unless the Contractor has specifically informed the OWNER in writing of such deviation at the time of submittal and the OWNER has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Submittals by the OWNER's approval thereof.

G. SUBMISSION SCHEDULE: Contractor shall submit a schedule showing dates for submission, review and approval of its Submittals. This schedule will be reviewed by the OWNER and any and all changes required by the OWNER shall be made by the Contractor. The final schedule shall be as approved by the OWNER. The schedule shall take into account the order of Work and the time required to prepare and approve the various Submittals. Such schedule shall ensure that all Contractor submissions are timely and that the dates set forth for each Submittal do not adversely affect the requirements of the Work, the Construction Progress Schedule or the time for completion set forth in this Contract.

H. RIGHTS IN SHOP DRAWINGS: The OWNER may duplicate, use and disclose in any manner and for any purpose Shop Drawings delivered under this Contract. This "Rights in Shop Drawings" Subparagraph shall be included in all subcontracts hereunder of any tier.

I. COORDINATION DRAWINGS: If requested by the OWNER, Contractor shall submit drawings demonstrating coordination of the various portions of the Work, in such form and with such detail as required by the OWNER.

Article 8 Standards, Tests And Inspections

A. REFERENCE SPECIFICATIONS OR STANDARDS: Quality and high standards are of the essence for the Work. Various standards and specifications are incorporated by reference in the technical section of the Specifications. In all such instances, the reference shall mean the latest edition, including the amendment or revision in effect as of the date of the Contract unless a specific issue is otherwise identified. If referenced specifications or standards contain requirements at variance with the individual sections of the Specifications, the more stringent provision shall govern. The Contractor shall have the responsibility of making any specified standard available at the Project Site, including, but not limited to, any sample or mock-up rooms required by the OWNER, as set forth in the Special Provisions.

B. INSPECTIONS AND TESTS

1. *Testing*. An independent laboratory and field tests firm is to be hired to determine compliance of construction with the Contract Documents. The test shall be made by a testing consultant employed by the Contractor. The costs and expenses of providing samples for and assistance in any testing shall be borne by the Contractor and are included in the Contract Price. Any Work in which untested materials are used without approval or written permission of the Designer shall be removed and replaced at the Contractor's expense. Work found to be unacceptable or unauthorized will not be paid for and, if directed by the Designer shall be removed and replaced at the Contractor's expense. Unless otherwise designated, tests in accordance with the cited standard methods of ASTM or other generally recognized or specifically authorized methods which are current on the date of advertisement for bids shall be made at the expense of the Contractor; provided, however, in the event that after such testing any Work is found to be defective or does not meet the requirements of the Contract Documents, the costs of retesting such Work and the costs of inspection services shall be paid by the Contractor. Samples shall

be taken by a testing laboratory employed by the Owner. All materials being used are subject to inspection, tests, or rejection at any time prior to or during incorporation into the Work. Copies of Contractor test reports shall be furnished to the Designer and Owner.

2. *Re-Testing.* The Owner shall have the right to re-test and if the test fails the Owner can deduct the costs of additional testing from any money due the Contractor; or if no money is due the Contractor, the Owner shall have the right to recover these costs from the Contractor, from its sureties, or from both.
3. *Layout and Surveys*. All layouts and surveying shall be accomplished by properly qualified personnel duly licensed in the State of North Carolina.
4. *Concealed Work*. If the OWNER has notified Contractor of its intent to test and/or inspect a portion of the Work, then, if such Work is concealed before such tests are performed or before approval is given, it shall be exposed, tested and restored at the Contractor's expense. Notwithstanding the foregoing, even if the OWNER has not notified Contractor of its intent to test and/or inspect a portion of the Work, the OWNER may require the Contractor to expose concealed Work for the purpose of testing and/or inspection. If the Work so exposed falls to meet the requirements of the Contract Documents, the Contractor shall be responsible for all costs associated with exposure, testing and/or inspection, replacement, and reconstruction or restoration. If the Work so exposed meets the requirements of the Contract Documents, the OWNER shall be responsible for all such costs.
5. *Performance Testing.* Witnessed performance tests, inspections and approvals shall occur when required by governing authorities or when required by the Contract Documents. The Contractor shall notify the OWNER at least three (3) business days in advance of the date the equipment will be ready for the final shop or field inspection or for performance tests. These tests, and any required retests, shall be performed at the Contractor's expense. The Contractor, at its cost, shall promptly obtain and provide the OWNER with all certificates and approvals.
6. *Obligation To Furnish For Testing*. The Contractor shall furnish promptly, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the OWNER. All inspections and tests by the OWNER shall be performed in such a manner as to not unnecessarily delay the Work. The OWNER reserves the right to charge to the Contractor any additional cost of inspection or test, when material or workmanship is not ready by the Contractor for inspection or test at the time specified, or when reinspection or retest is necessitated by prior rejection.

C. CORRECTION OF WORK

1. Any deficiencies identified by the OWNER will be noted for correction by the Contractor in a notification from the OWNER. Correction of such deficiencies shall be in addition to and not in lieu of punch list(s) of deficiencies submitted to the Contractor by the OWNER or prepared by the Contractor. Receipt of any such notification shall not be construed as the OWNER’s qualified acceptance of the Work nor shall it waive the OWNER’s night to require the Contractor to remedy, at the Contractor's sole expense, any other deficiencies which may not be listed on such notification.
2. In the event that the Contractor receives from the OWNER a notification of faulty or unacceptable Work, the Contractor shall promptly remove from the premises all Work condemned as failing to conform to the requirements of the Contract Documents, whether incorporated in the Work or not. The Contractor shall then promptly replace and re-execute its own Work in accordance with the Contract Documents without change to the time of completion and without expense to the OWNER and shall bear the expense of making good all Work of other contractors destroyed or damaged by such removal or replacement. In addition, the Contractor shall perform all cutting and fitting for other trades necessitated by the Contractor's errors.

3. Should the Contractor refuse to correct faulty or damaged Work, or should the OWNER consider it inadvisable for the Contractor to do so, the OWNER may either (a) authorize another contractor to correct the Work at the Contractor's expense or (b) accept the faulty or damaged Work and obtain from the Contractor a credit, contained in a Change of Contract, representing the diminished value of the Work accepted.

D. FINAL INSPECTION AND FINAL PUNCH LIST: In addition to any punch list(s) prepared by Contractor and any unacceptable Work previously identified by the OWNER, the OWNER shall, prior to Substantial Completion, make a final inspection of all Work and prepare a final punch list ("Final Punch list") of Work that does not conform with the Contract Documents. Contractor shall correct all non-conforming Work identified in the Final Punch list within thirty (30) days after Contractor's receipt of the Final Punch list. Correction of all faulty or unacceptable Work by the Contractor, including, without limitation, correction of all items specified in the Final Punch list, shall be a condition precedent to Final Payment.

E. NON-WAIVER OR ACCEPTANCE: Any inspections or tests conducted by the OWNER shall be for the sole benefit of the OWNER and shall not relieve Contractor of the responsibility of providing quality assurance control measures to assure that the Work strictly complies with the requirements of the Contract Documents. The performance of any inspections or tests, or the omission of any inspections or tests, or a decision not to perform any inspection or test, by the OWNER, any agent, employee or consultant of the OWNER, shall not be a waiver of any of the Contractor's obligations hereunder and shall not be construed as constituting or implying approval or acceptance of the Work or any part thereof. No payment to the Contractor (including Final Payment) or approval or acceptance by the OWNER of any Work shall constitute final acceptance of the Work if it is later discovered that such Work was not performed in accordance with the requirements of the Contract Documents.

Article 9 Inspection And Use Of Premises

A. The OWNER and all persons specified by the OWNER shall have safe access to the Work at all times for inspection purposes. Notwithstanding the foregoing, the OWNER, and its representatives shall not be responsible for, or have control or charge of, any construction means, methods, techniques, sequences or procedures or for safety and security precautions or progress in connection with the Work, nor shall they be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents.

B. The OWNER reserves the right to occupy and use, for itself or any of its affiliates, any portion of the Project and operate any equipment that is part of the Project without constituting acceptance of the Contractor's Work or material involved either in whole or in part, unless the OWNER, in its sole discretion, expressly accepts portions of the Project or pieces of equipment by written notice to the Contractor.

C. The Contractor shall confine its apparatus, the storage of materials and the operations of its workmen to limits indicated by Laws and directions of the OWNER. The Contractor shall not encumber the Site with its material except for such material as is absolutely necessary for the Contractor to perform the Work without interruption and as approved by the OWNER.

D. The Contractor shall enforce the instructions of the OWNER regarding signs, advertisement and smoking. No advertising signs, name signs or logos of any sort shall be displayed on the Project site, except those that the OWNER may elect to display and those provided for herein.

E. Throughout the term of this Contract, and as required by the OWNER, Contractor shall provide the OWNER, its representatives and their employees with access to Contractor's trailer(s), telephone(s) and restroom facility(ies) at the Project Site.

F. The Contractor shall be responsible for permanently fixed service facilities and systems in use during progress of the Work and shall strictly adhere to the following procedures:

1. Prior to acceptance of the Work by the Owner, the Contractor shall remove and replace any part of the permanent building systems damaged through use during construction.

2. Temporary filters shall be installed in each of the heating and air conditioning units, return air grilles, and other locations to prevent intrusion of dust, dirt, and debris during construction. Temporary filters shall be removed and replaced with new filters immediately prior to Substantial Completion.

3. Extra effort shall be maintained to keep the building clean and under no circumstances shall air systems be operated if finishing operations are creating dust in excess of what would be considered normal if the building were occupied.

4. When the permanent lighting system is used during construction, lamps shall be replaced and shall be new on the date of Substantial Completion.

Article 10 Protection Of Work And Property; Safety; Existing Utilities

A. PROTECTION OF WORK: The Contractor shall continuously maintain adequate protection of all Work from damage due to any cause, including inclement weather, and shall protect all property of the OWNER from damage or loss. The Contractor shall adequately protect improvements within public rights-of-way and property of adjacent land the OWNERs. The Contractor shall protect and secure its Work and materials and the Project against loss by theft or otherwise. The obligations of this Article shall apply, regardless of whether the property in the Contractor's possession was purchased by the OWNER or the Contractor.

1. The Contractor shall be responsible for the entire site of the Project and for its reasonable and necessary protection and security, as required by laws or ordinances governing such conditions, or by custom or sound construction practices, and shall share such responsibilities as may be agreed upon among them, or in the absence of such agreement, as may be directed by the Contract Documents, Owner, or Designer.
2. The Contractor shall be responsible for any damage to the Owner's property, or that of others, by the Contractor or the Contractor’s employees, Subcontractors, sub-subcontractors, or their employees or agents, and shall make good such damages. The Contractor shall be responsible for and pay for any such claims against the Owner.
3. The Contractor shall protect all landscaping designated to remain in the vicinity of the operations and barricade all walks, roads, and areas as necessary to keep the public away from the construction.
4. The Contractor shall provide cover and/or protect all portions of the Work and provide all materials necessary to protect the Work whether performed by the Contractor or any of the Subcontractors or sub-subcontractors. Any Work damaged through the lack of proper protection, or from any other cause, shall be repaired or replaced without extra cost to the Owner or extension to the Contract Time.

B. SAFETY: Contractor shall be responsible for preparing, implementing, maintaining and supervising all safety and security precautions and programs in connection with its Work, the Project and the Site. Contractor shall take all necessary precautions for the safety of its employees and all other persons who may be affected by Contractor's Work. All safety measures and safety programs shall fully comply with Federal, State, and local laws, rules, regulations, and building code requirements relating to the prevention of accidents or injuries to persons on or about the location of the work.

1. The Contractor shall designate a responsible officer or employee as safety inspector, whose duties shall include accident prevention on the Project as well as implementation of the

Contractor's safety measures and safety programs on the Project. The name of the safety inspector shall be made known to the Designer and the Owner at the pre- construction conference.

2. The Contractor shall adhere to the rules, regulations, and interpretations of the North Carolina Department of Labor's Occupational Safety and Health Standards for the Construction Industry (29 CFR Part 1926 as adopted in 13 NCAC 07F.0201, including 29CFR Part 1910 General Industry Safety and Health Standards applicable to construction) and N.C. Gen. Stat. §95-126 through 155 (Occupational Safety and Health) as well as all revisions and amendments to such standards or statutes as may occur throughout the performance of the Work.

C. ACCIDENTS: In case of an accident involving an injury to an employee (including any employee of anyone working under Contractor), Contractor shall notify the OWNER within eight (8) hours and shall file a fully detailed accident report as soon as possible and not later than twenty-four (24) hours after such accident. Contractor shall also file promptly such reports as are required by its insurance carrier and such other civil authorities as might govern and simultaneously provide copies to the OWNER.

D. EMERGENCIES: In an emergency affecting the safety of life or the Work or of adjoining property, the Contractor is hereby permitted to act in its discretion to prevent such threatened loss or injury, and it shall so act without appeal if so authorized or instructed. Any costs incurred by the Contractor because of emergency work shall be determined by agreement of the Parties hereto and confirmed by a Change of Contract.

E. UTILITIES: The Contractor shall establish and maintain direct and continuous contact with local utilities before commencing any Work. The OWNER will provide the Contractor, for its general information only, records in the OWNER's possessions with regard to the nature and location of known utilities but does not warrant or represent that the information is accurate and complete. The Contractor shall verify the locations of any utilities which may be affected by its operations (and, if any variations are found to exist from the information supplied by the OWNER, the Contractor may be entitled to a Change of Contract for additional time or costs resulting from such deviations). At least fourteen (14) days prior to the anticipated Work, Contractor shall submit in writing to the OWNER and to utility the OWNER's for their review and approval of its plan for 1) performing the Work, and 2) promptly resolving any utility conflicts to avoid delay. No Work in the vicinity of, or which may affect utilities, shall be started until approved by the OWNER and the utilities. The Contractor shall prepare and maintain an updated list of information on all Project-related utilities including company names, addresses, contact persons and types of utility. During the course of the Work, Contractor shall supply, at its own cost, all temporary utilities necessary for performance of the Work. Contractor shall be responsible for connecting to all necessary permanent utilities for the Project and shall file and process all applications for all such permanent utilities on behalf of the OWNER. Hookup fees for such permanent utilities shall be paid by the Contractor.

Article 11 Hazardous Materials And Pollution Controls

A. HAZARDOUS MATERIALS: In the event the Contractor encounters on the site previously unidentified material reasonably believed to be a Hazardous Material which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the OWNER in writing. The Work in the affected area shall not thereafter be resumed except by written agreement of the OWNER and Contractor if in fact the material is a Hazardous Material and has not been rendered harmless. The Work in the affected area shall be resumed after abatement of the Hazardous Material, or when it has been rendered harmless, as agreed in writing between the OWNER and Contractor.

B. POLLUTION CONTROLS: Contractor shall not burn waste without prior written permission from the OWNER. Contractor shall control the generation of dust resulting from the Work and shall undertake such

dust controls as are required by the OWNER. Contractor shall undertake reasonable efforts to minimize the amount of noise and light generated by the Work and the adverse affects of such noise and light on adjacent property the OWNER's and the public. Contractor shall at all times comply with the Laws applicable to the foregoing activities.

Article 12 Clean-Up

A. Daily Clean-Up

1. At all times, Contractor shall keep the Site and adjacent property free from accumulation of trash and debris that results from the operations of the Contractor, and its subcontractors. Contractor shall provide for all clean-up and offsite disposal of all such trash and debris.
2. If the Contractor falls to clean up as provided in this Paragraph, the OWNER reserves the right, upon eight (8) hours written notice to the Contractor, to proceed to remove the debris, the cost of which will be charged against the Contractor.

B. Final Clean-Up & Site Restoration

1. Prior to Substantial Completion, the Contractor shall employ experienced persons to make a final clean-up of the Project site or such portions of the Project as the OWNER may designate.
2. At the completion of the Work, Contractor shall remove all trash, waste and debris from the Site as well as its tools, temporary facilities, construction equipment, machinery and surplus materials and shall deliver the site in a ready to use condition.

Article 13 Construction Progress Schedule

A. Not later than thirty (30) days following execution and delivery of the Construction Agreement by Owner to Contractor, the Owner shall deliver to the Contractor a Notice to Proceed. The Notice to Proceed shall state a commencement date on which it is expected that the Contractor will begin the Work to be performed under the Agreement. The Contract Time shall be measured from said specified commencement date. The commencement date stated in the Notice to Proceed shall not be earlier than three (3) days after the Notice to Proceed is served on the Contractor. No Work shall be done prior to the date specified in the Notice to Proceed.

B. SCHEDULE: Within fourteen (14) days after receipt of the Construction Agreement by the Contractor for signatures, the Contractor shall prepare and submit to the Designer and Owner for review and approval a preliminary progress schedule for the Work pursuant to the requirements stated in the Contract Documents. The Contractor shall prepare and submit a calendarized Critical Path Method ("CPM") schedule (the "Construction Progress Schedule" or "Schedule") to the OWNER within thirty (30) days of the execution of the Contract. The Schedule shall contain a detailed graphic representation of all activities that could affect the progress of the Work, including a schedule of Submittals, shall become a Contract Document and may be revised only with the written consent of the OWNER. The Contractor agrees to comply with the Construction Progress Schedule, as revised as provided herein, and agrees that the Work shall be prosecuted regularly, diligently and without interruption, within the time specified.

C. THE CONTRACT CONSTRUCTION SCHEDULE IS A CONTRACT DOCUMENT: The Contractor represents that the Contract Construction Schedule has been reviewed in detail, that the Contractor participated in its preparation, that all of the activities which impact, limit, or otherwise affect the time of completion of the Work are shown in the Contract Construction Schedule and that all of the activities of others which impact, limit, or otherwise affect the start, duration, or completion of the Contractor's activities are also shown. The Contractor further represents that the Contractor can and will complete each activity within the time shown for that activity. Time is of the essence with respect to each such activity and Completion Date.

D. SCHEDULE UPDATES AND REVISIONS: The Schedule will be revised, updated and submitted by the Contractor at least the first of each month. However, the OWNER reserves the night to require Contractor to update the Schedule as often as the OWNER deems reasonably necessary. Any revisions to the Schedule shall be accompanied by a written explanation of the reasons for such revisions and no such revision shall be incorporated into the Schedule without the OWNER's written consent. A copy of the Schedule shall be maintained at all times on the Site and revised and updated copies shall be provided to the OWNER at any time if requested. Failure of the Contractor to deliver an initial Schedule within the time specified above or to deliver timely updates of such Schedule upon request by the OWNER, or as provided for above, may be grounds for the OWNER to withhold progress payments for the work completed until such time as the Schedule(s) are delivered to the OWNER.

E. ADDITIONAL WORK TO COMPLY WITH SCHEDULE: In the event that the Contractor or any of its Subcontractors on their own initiative changes the sequence or duration of any of the construction activities from such sequences or durations as indicated on the Schedule established at the commencement of the Work, the OWNER, unless agreed in writing otherwise, will not be liable for any claims for any direct or indirect costs, delay costs, costs related to loss of efficiency, resequencing of work or extension of time or any other costs which may result from such actions by the Contractor or its Subcontractors. In addition, Contractor shall not be entitled to any change in the terms of this Contract relating to the foregoing changed sequences or durations without the OWNER's prior written approval of such changed sequences or durations. Although Contractor may finish early, Contractor agrees that it has no right to finish early or to file a claim for any alleged delay to its right to finish early. Should the progress or conditions of the Work require Work to be performed after regular hours, or should the Contractor elect to perform Work after regular working hours, the additional cost of performing such Work shall be borne by the Contractor.

F. The Contractor may be entitled to an extension of the Contract Time (but no increase in the Contract Sum) for delays arising from unforeseen causes beyond the control and without the fault or negligence of the Owner, the Contractor or the Contractor's Subcontractors as follows:

1. Labor disputes and strikes that directly impact the critical path activities of the Contract Construction Schedule;
2. Acts of God, tornado, fire, hurricane, blizzard, earthquake, typhoon, or flood that damage completed Work or stored materials.
3. Acts of the public enemy; acts of the State, Federal, or local government in their sovereign capacities.
4. Abnormal inclement weather as defined below
   Force Majeure. Neither Party shall be liable to the other Party for any failure or delay caused by events beyond such Party's control and not due to its own negligence, provided that such Party uses commercially reasonable efforts to resume performance as soon as ressonably practicable. The non-performing Party shall notify the other Party of the force majeure event within twenty-four (24) hours of the onset thereof.
   In the event that a force majeure event precluded PROVIDER from performing services and/or providing goods for a period of ten (10) consecutive business days, the COUNTY shall have the right to: (a) procure replacement goods and/or services from an alternative source and/or (b) terminate the Contract or portions(s) of Contract upon written notice to PROVIDER.

G. If the Contractor submits a construction schedule, progress report, or any other document that indicates or otherwise expresses an intention to achieve completion of the Work prior to any Completion Date required by the Contract Documents or prior to expiration of the Contract Time, no liability of the Owner to the Contractor for any failure of the Contractor to so complete the Work shall be created or implied.

H. Should the Contractor fail to start any activity on the start date shown in the Contract Construction Schedule or become delayed, the Contractor shall, without being entitled to any increase in the Contract Price or other compensation, work overtime, increase labor forces or take such other action as may be

necessary or appropriate to complete the activity by the Completion Date shown on the Contract Construction Schedule, or as such Completion Date may have been adjusted.

I. Should any monthly revision of any Contract Construction Schedule show that the Contractor is behind on any activity, the late completion of which could delay Substantial Completion of the Work, the Owner shall be entitled to withhold from the next Progress Payment due the Contractor an amount not exceeding the amount the Owner would be entitled to in Liquidated Damages, should Substantial Completion be delayed by the same number of days that the Contractor is currently behind schedule. If, subsequently, the Contractor's progress, as shown by any succeeding monthly revision to the Contract Construction Schedule, is such that the anticipated delay no longer exists, the Owner shall pay with the Progress Payment next due to the Contractor such amounts as have been withheld in accordance with this paragraph.

J. All time limits stated in the Contract Documents are of the essence. The time of beginning, rate of progress, and time of completion are essential conditions of the Contract Documents. If the Contractor refuses or fails to prosecute the Work with such diligence as will ensure its completion pursuant to the Progress Schedule, as modified hereunder, or if the Contractor abandons the Work or if it falls to complete the Work within said time, or if the Contractor falls to maintain the progress of the Work in accordance with the Progress Schedule, the Contractor shall be liable for all direct and indirect damages sustained by the OWNER until all the Work required by the Contract Documents is complete and accepted by the OWNER or for the liquidated damages provided for in the Contract. In the event of a default termination, the Contractor's liability may also include termination for default damages. The OWNER may deduct from subsequent payments due the Contractor under this or any other contract with Contractor or from any sums retained, all or such part of these sums as may be required to pay the aforesaid damages, with the Contractor being responsible for any deficiency which it shall pay the OWNER upon demand.

K. On any day that the Contractor considers that the Project is delayed by adverse weather conditions, the Contractor shall identify in writing to the Designer and the Owner the adverse weather conditions affecting each activity, the specific nature of the activity affected, the number of hours lost, and the number of and identity (by responsibility or trade) of workers affected and shall obtain from the Designer written recognition of the delay. The time for performance of this Contract includes an allowance for a number of calendar days which may not be suitable for construction Work by reason of adverse weather. The Contract Time will be extended only if the number of calendar days of adverse weather recognized by the Designer exceeds the number of inclement weather days set forth below, and the Contractor demonstrates how this adverse weather impacts activities on the critical path of the Contract Construction Schedule.

Month	Number of Inclement Weather Days
January	15
February	15
March	10
April	10
May	9
June	9
July	9
August	8
September	9
October	9
November	10
December	12

L. If the Contractor believes that the progress of the Work has been adversely affected by adverse weather recognized by the Designer during a particular month, the Contractor shall submit a written request for extension of time to the Designer. Such a request for time extension of the Contract Time

shall be submitted by the tenth (10th) day of the month following that month in which the adverse weather is encountered. The request shall include, but is not limited to, the following information:

1. Detailed description of weather's effect on scheduled activities and its net effect on the critical path of the Project, and
2. Weather records from the official weather station nearest the Project site and records of actual observation as contained in daily reports, correspondence, or other documentation.

M. The Contractor specifically recognizes that a delay by the Contractor in achieving any Completion Date can have the effect of delaying the Substantial Completion of the Project, that such delay in Substantial Completion of the Project will necessarily cause damages, losses, and expenses to the Owner, including, but not limited to and by way of illustration only, increased capitalized costs and interests for the Project, increased and extended Project overhead, Designer's and Consultant's fees, increased costs of construction, increased and extended operation costs of other facilities, and inefficiency and loss of productivity, and that such damages, losses, and expenses may not be readily identifiable or ascertainable at the time they are incurred or at any time. Therefore, and in recognition of these factors and the likelihood that actual damages from his delay will not be readily ascertainable, the Contractor agrees to pay to the Owner, **$500 per calender day** as **Liquidated Damages** and not as a penalty, the sum identified in the Supplemental Conditions hereto as the Liquidated Damages per Day, for each day by which the failure to meet any Completion Date shown in the Contract Construction Schedule, adjusted in accordance with this Article, delays the Substantial Completion of the Project.

Article 14 Reports And Meetings

A. The Contractor shall each day prepare and deliver to the OWNER a Weekly Report showing the number of foremen, journeymen mechanics, and other personnel employed at the Project that day, and the location and nature of the Work performed. Concurrently therewith, if requested by the OWNER, the Contractor shall deliver to the OWNER the various Subcontractors' Daily Reports.

B. Not more than thirty (30) days following execution of the Contract, but prior to commencement of demolition, the Contractor and representatives of all Subcontractors designated by the OWNER shall attend a pre-demolition meeting scheduled by the OWNER. The Contractor shall be represented by its Project Manager, General Superintendents and other persons designated by the OWNER; Subcontractors shall be represented by their supervisory personnel. The purpose of the meeting will be to discuss matters relating to the Project.

C. Each week during the progress of the Work, the Contractor will conduct a Progress Meeting at a time and place agreed upon by the Contractor and the OWNER, during which the Contractor shall review the progress of the Work relative to the Demolition Progress Schedule and discuss ways of maintaining the progress of the Work. The Contractor shall require Subcontractors who are active on the Project at the time the meeting is held to be present and be represented by a person authorized to commit their company. If requested by the OWNER, the Contractor shall require Subcontractors who are not active on the Project to be present and be represented by a person authorized to commit their company. The Contractor shall keep accurate minutes of each meeting and, if requested by the OWNER shall deliver a signed copy of each set of minutes to the OWNER within seventy-two (72) hours of each meeting. The OWNER shall be entitled to attend and participate in all such Progress Meetings.

D. By the fifth (5th) day of each month, the Contractor shall submit to the OWNER a written Contract Status Report, which report shall, at a minimum, show, in detail, the progress of the Work relative to the approved Demolition Progress Schedule; a listing of outstanding Submittals, requests for information or proposals upon which the Contractor is awaiting response from the OWNER, or its consultants, and the impact, if any, such Submittals, requests for information or proposals have on the Construction Progress Schedule; the Contract Sum, including additions or deductions arising out of accepted Changes of Contract; and a

listing of pending or outstanding approved and proposed Changes of Contract (Change Order log) and Contractor's claimed cost and/or extension of time resulting there from.

E. Failure of the Contractor to timely deliver the reports required or requested by the OWNER pursuant to this Article or to schedule and hold the meetings required by this Article shall constitute cause for the withholding of payments by the OWNER.

Article 15 Delays

A. FORCE MAJEURE AND CLAIMS FOR DELAYS: As defined by paragraph 11 of the Contract.

B. SUSPENSION OF WORK:

1. Generally – After Work has started, the Contractor shall not suspend Work without written permission of the OWNER. When under suspension, the Work shall be put in proper and satisfactory condition, and properly protected, including as directed by the OWNER. In all cases of suspension, the Work shall not again be resumed until permitted by written order of the OWNER.
2. The owner's right to suspend – the OWNER reserves the right at any stage of the Work, to suspend operations thereon, or upon any part thereof, either for a time named or indefinitely, by giving the Contractor written notice.
3. Extension of time – if the OWNER's rights of suspension are exercised, the OWNER shall grant to the Contractor an extension of time for the performance of the Work equal to the time of such suspension. However, no adjustment shall be made under this Paragraph for any suspension to the extent that (a) performance would have been suspended, delayed or interrupted by any other cause, including the fault or negligence of Contractor; or (b) equitable adjustment in the time for performance of the Work is provided for or excluded under any other provision of this Contract.
4. Adjustment To Contract Sum – if the OWNER suspends the Work pursuant to this Paragraph, and such suspension impacts the critical path costs of the Work for an aggregate of thirty (30) days, then Contractor shall be entitled to extended general condition for each additional day that the Work is so suspended in excess of the thirty (30) days.

Article 16 Minority Business Enterprise Program

The Contractor shall at all times comply with the latest edition of the Guilford County Minority Business Enterprise Policy. All documentation substantiating compliance with the requirements of this program shall be delivered to the Owner as stipulated in the Contract Documents. A copy of the Guilford County Minority Business Enterprise Policy is included in the Project Manual.

Article 17 Measurement Of Quantities

All Work completed under the Contract Documents shall be measured by the Contractor using United States customary units of measurement. The method of measurement and computations to be used in determination of quantities of material furnished and of Work performed under the Contract Documents shall be those methods set forth in the Contract Documents or, if not specifically set forth therein, the method generally recognized as conforming to good engineering practice.

Article 18 Subcontractors

A. The Contractor shall furnish the OWNER, prior to execution of the Contract, a complete list of all major Subcontractors and Suppliers and such other Subcontractors or Suppliers as may be requested by the OWNER, who are proposed for the execution of the Work (including address, phone number and contact

name for each such Subcontractor and Supplier). At any time, upon request of the OWNER, Contractor shall make available to the OWNER copies of all bids, proposals, contracts, subcontracts or other information concerning the Subcontractors and Suppliers, including financial statements, which may be helpful to the OWNER, or any person or entity providing financing on behalf of the OWNER, in evaluating any of the Subcontractors proposed to perform any part of the Work. Contractor may also be required to make available to the OWNER with respect to the proposed Subcontractors and Suppliers such other proof of their financial stability and experience, lists of completed projects and letters of reference as may be required by the OWNER.

B. The Contractor shall not assign any portion of this Agreement nor subcontract the Work in its entirety without the prior written consent of the Owner. Except as may be required under terms of the bonds required by the Contract Documents, no funds or sums of money due or to become due to the Contractor under the Contract Documents may be assigned.

Article 19 Measurements

Before ordering material or doing Work which is dependent for proper size or installation upon coordination with building conditions, the Contractor shall verify all dimensions and shall be responsible for the correctness of same. No consideration will be given for any claim based on differences between the actual dimensions and those indicated in the Contract Documents. Any discrepancies between the Contract Documents and the existing conditions shall be referred to the Designer for adjustment before any Work affected thereby is begun.

Article 20 Cutting, Patching And Fitting

The Contractor shall do all cutting, fitting, and patching of the Work that may be required to make its several parts come together properly and fit it to receive or to be received by Work shown in or which can be reasonably implied from the Contract Documents.

Article 21 Warranties And Guarantees

A. The Contractor warrants to the OWNER that all Work furnished under this Contract will be of good quality, free from faults and defects and in strict conformance with the Contract Documents for a period of one (1) year from the date of Substantial Completion of the entire Project or for a longer period if so specified elsewhere in the Contract Document. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. This warranty or any other warranty provided by the Contractor pursuant to the Contract Documents shall not be limited by the provisions of Paragraph 21(B).

B. The Contractor shall require the warranty contained in Paragraph 21(A) in all subcontracts and shall include the requirement that the OWNER be reimbursed for any unsuitable Work or to other work resulting from such defects. The Contractor agrees, at its expense and without cost to the OWNER as part of its guarantee under this Article 21 to repair or remove or replace, as directed by the OWNER, all Work which proves defective during the warranty period or which falls to conform to the Contract Documents; to repair, remove, and replace, as directed by the OWNER, all unsuitable portions of the Work resulting from or which is incidental to defects in the Work as stated in this Article 21, or which are damaged by the repair of such defects. All repairs, removals and replacements must be commenced upon receipt of written notice from the OWNER at times approved in advance by the OWNER.

C. The Contractor shall furnish sufficient workers and materials to ensure prompt completion thereof. Should the Contractor fall to proceed in accordance with the provisions of this Article 21, the OWNER, without further notice to the Contractor, may furnish all labor and material necessary for said repairs, or removals and replacements; all costs associated with such repair or replacement work shall be charged to the Contractor.

D. Upon Substantial Completion of the Project and prior to Final Payment, the Contractor shall prepare, organize, assemble and transmit to the OWNER two (2) complete sets, including one original set, of all written warranties and guarantees of others applicable to the Work or required by the Contract Documents and for all restored surfaces. All warranties and guarantees of others with regard to services or materials shall be made for the benefit of the OWNER and the Contractor and shall be enforceable by either the OWNER or the Contractor. The Contractor shall execute any documents or take such action as may be necessary to ensure that the OWNER receives the benefits thereof. Should the Contractor or a Subcontractor replace any part of the Work, all warranties or guarantees applicable to the component replaced shall begin anew from the date of the OWNER's acceptance of the replacement.

E. No contract or purchase pertaining to the Project shall allow for waiver of warranties or guarantees.

F. Nothing contained in this Article 21 shall be construed to establish a period of limitation with respect to any other obligation which the Contractor may have under the Contract

G. The Contractor's guarantees and warranties under this Article shall not be construed to limit the OWNER's right of recovery for defects in the Contractor's Work or the items provided by the Contractor, whether in warranty, contract or any other applicable legal theory, which may arise under other provisions of the Contract or under law.

Article 22 Project Record Documents

A. The Contractor shall keep one record copy marked "As-Built" of all Specifications, Drawings, Addenda, Modifications, and Submittals at the Project in good order and annotated at least monthly to show all changes made during the construction process. Such monthly annotations and their approval by the Designer shall be a condition precedent to approval by the Designer of each monthly Request for Payment. Said record copy shall be stored at the Project and fully protected from damage by fire or other hazard. This record copy shall be available to the Designer and Owner for inspection at all times and shall be delivered to the Designer for the Owner's purposes prior to the Designer's certifying Substantial Completion of the Work.

B. The Contractor shall check all sections of the Specifications for specific references to maintaining record drawings and diagrams (the "Project Record Documents"). These references are intended to clarify record documentation for particular items and are not intended to limit requirements generally.

C. The Contractor shall ensure that each of the Project Record Documents shall be clearly marked "As-Built Drawings" and shall be maintained in good condition and available at all times for inspection by the OWNER. The Contractor shall mark up the most appropriate documents to record significant changes during the construction process and significant details not shown in the original Contract Documents.

D. The Contractor shall ensure that the information given shall include, but not be limited to, the actual location of the underground utilities and appurtenances, referenced to permanent surface improvements scheduled to remain.

E. At the completion of the Project, the OWNER will furnish the Contractor with a complete set of current Contract Drawings. The Contractor shall transfer the recorded changes to the Drawings neatly with a permanent line of sufficient weight to clearly show the record changes. The Contractor shall stamp and sign a certification statement on each Drawing and page that the Drawings as submitted are correct and accurately depict the Work as it has been constructed. These drawings (the "As-Built Drawings") shall be submitted to the OWNER prior to acceptance of the Project by THE OWNER and prior to the release of the Contractor's Final Payment.

Article 23 Disputes

A. Any and all disputes arising hereunder which are not otherwise amicably resolved by mutual agreement shall be resolved by the courts of competent jurisdiction located in the state in which the Project is located.

B. The presence of claims, disputes or controversies between the Contractor and any other party, including the OWNER, over any matter whatsoever, or legal proceedings arising from such claims, disputes or controversies, shall not relieve the Contractor of its obligation, during the resolution of any such claims, disputes or controversies, to continue to perform its Work properly and timely and to comply with all of the terms and conditions of the Contract.

Article 24 Separate Contracts

It is expressly understood that the Owner may deploy the Owner's own employees or engage other separate prime contractors to perform Work as a part of the Project whose work will be performed simultaneously and sequentially with the performance of the Work by the Contractor. It shall be necessary for the Contractor to coordinate construction activities with such other contractors, particularly with respect to access to work areas, storage of materials, and use of elevators and other common facilities. The Contractor shall diligently and in good faith cooperate with the Owner, the Designer, and all other contractors with respect to such matters and shall regularly and faithfully attend any and all meetings called by the Owner or the Designer with respect to such matters. Any disputes between the Contractor and any other separate prime contractor with respect to such matters shall be resolved in accordance with the claim and dispute resolution procedures in the Agreement.

Article 25 Changes In The Work

A. Without invalidating the Contract Documents, the Owner may, at any time, or from time to time order additions, deletions, or revisions in the Work. Said additions, deletions, or revisions shall be authorized only by written Change Orders, Construction Change Directives or Field Orders. Upon receipt of a Change Order, Construction Change Directive or Field Order, the Contractor shall proceed with the Work involved. All such Work shall be executed under the applicable conditions of the Contract Documents. If any change causes an increase or decrease in the Contract Price and/or an extension or shortening of the Contract Time, adjustments shall be made as provided in these Articles.

B. In order to expedite the Work and avoid or minimize delay in the Work that might affect the Contract Price or Contract Time, the Designer may issue a Change Order in the form of a Construction Change Directive which when signed by the Owner and Designer, directs the Contractor to proceed promptly with the Work involved. Any claim for an adjustment in Contract Price or Time, if not defined in the Construction Change Directive, shall be promptly made in writing in accordance with the procedures defined these Articles.

C. The Designer may authorize minor changes or alterations in the Work not involving change in the Contract Price or in the Contract Time and not inconsistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order. Such alterations shall not invalidate the Contract Documents nor release the surety. If the Contractor believes that any minor change or alteration authorized by the Designer entitles him to an increase in the Contract Price and/or an extension of Contract Time, he may make a claim therefore as provided in these Articles.

D. Except in an emergency endangering life or property, no change shall be made by the Contractor except upon prior written Change Order, Directive or Field Order authorizing such Change.

E. Increases in the Contract Price and/or extensions of the Contract Time for additional Work performed by the Contractor shall only be in accordance with a written Change Order signed by the Owner. The Contractor shall not be entitled to additional time or to additional compensation for any Work performed or material supplied which is claimed to have been authorized or settled by an "oral" change, or by a "constructive" or "implied" change, or by a course of conduct, or by any action or non-action by the Owner,

Designer, or any other persons, or by any means whatsoever other than by a written Change Order for such Work or material signed by the Owner.

F. Changes in the Work resulting from emergency shall not invalidate the Contract Documents nor release the surety.

G. Neither the Owner nor the Designer shall be responsible for verbal instructions which have not been confirmed in writing, and in no case shall such instructions be interpreted as permitting a departure from the Contract Documents unless such instruction is confirmed in writing and supported by a proper Change Order, Construction Change Directive or Field Order, whether or not the cost is affected.

H. The Owner, in its sole discretion, may require that the Contractor notify the Contractor's sureties of any changes affecting the general scope of the work or change in the Contract Price, and that the amount of applicable bonds shall be adjusted accordingly. If this requirement is exercised, the Contractor shall furnish proof of such adjustment to the Designer and the Owner.

1. If this requirement is exercised, the Change Orders shall require written consent of the Contractor's surety. At the time of signing a Change Order, the Contractor shall be required to certify as follows:

   "I certify that all sureties have been notified that my contract has been altered by the amount of this Change Order, and that a copy of the approved Change Order will be mailed to all sureties upon its receipt by me."

2. If this requirement is exercised, no payment to the Contractor on account of any Change Order shall become due or payable until written evidence of the surety's consent to the Change Order has been furnished to the Designer and to the Owner, and the furnishing of such written consent is a condition precedent to such payment.

I. The Contractor shall support all requests for Change Orders with a detailed cost breakdown showing cost of materials, labor, equipment, transportation, other items, Contractor's overhead and profit, and total cost, in accordance with methods defined in this Article, and, if the request seeks an extension of the Contract Time, with a time-related diagram which demonstrates specifically why an increase in construction time is needed.

J. When a request for a Change Order involves a Subcontractor, the Contractor shall provide quotation from same on Subcontractor's letterhead. The Subcontractor's quote shall list materials, equipment, and labor separately, and show overhead and profit in the manner provided in paragraph 14.8.

Article 26 Changes Of The Contract Price

A. The Contract Price constitutes the total compensation payable to the Contractor for performing all Work under the Contract Documents. All duties, responsibilities, and obligations assigned to or undertaken by the Contractor shall be at his expense without change in the Contract Price. The Contract Price may only be changed by a Change Order.

B. Any claim for an adjustment in the Contract Price shall be in writing and written notice of any event, action, or non-action which may become the basis of a claim shall be delivered to the Owner and the Designer within three (3) days of the occurrence, or the beginning of the occurrence, of any such event, action or non-action giving rise to the claim. Such written notice is a condition precedent to the making of a claim, and such notice shall describe the basis of the potential claim with reasonable detail and clarity.

C. A claim shall be made in writing and shall be delivered to the Designer and the Owner no later than fourteen (14) days after such notice. The claim shall describe in detail the basis for the claim, with specific reference to any provisions of the Contract Documents, by paragraph, drawing number, or other specific identification, and shall state the amount claimed and how it is calculated. If the Contractor, at the time the claim is made, is unable to state the amount claimed with accuracy, the Contractor shall so state and provide the estimated amount and the basis on which the amount is to be calculated. At the earliest date

practicable, but in no event more than thirty (30) days after Contractor's notice of claim, the Contractor shall supplement the claim with an accurate statement of the amount claimed and how it has been calculated. The Contractor shall provide, in writing, in support of the claim all such explanations, arguments, data, receipts, expert opinions, or other documents or information as the Contractor deems appropriate to be considered in support of the claim. A claim may properly be rejected by the Owner by reason of the Contractor's failure to submit adequate or accurate documentation or information, except that within seven (7) days after being given notice that the claim has been rejected on this basis, the Contractor may submit additional documentation or information. No claim for a change of the Contract Price shall be considered or granted (except solely at the discretion of the Owner) unless a claim is so made, nor shall the Contractor be entitled to any increase in the Contract Price unless the Contractor has given notice and made such a written claim within the times required. The Owner shall decide, after obtaining the advice of the Designer, whether an increase in Contract Price is warranted, and the amount of such increase shall be determined as provided in paragraphs below. Any change in the Contract Price resulting from any such claim shall be incorporated in a Change Order.

D. The Owner shall advise the Contractor of its decision with respect to the claim within fourteen (14) days of its receipt, or of the receipt of additional documentation or information if the absence of such has previously been the basis of rejection of the claim; provided, however, that if, in its sole discretion, the Owner deems that review or consideration of any part of the claim or any matter related thereto by its governing Board is necessary or appropriate, it shall so advise the Contractor and shall provide its decision to the Contractor within seven (7) days after such Board consideration, review or action. Any claim on which the Owner has not provided its decision to the Contractor within the applicable time period shall be deemed denied.

E. If the Contractor is not satisfied with the decision of the Owner, the Contractor may within seven (7) days of receipt of the Owner's decision initiate the mediation process as described in Appendix A to the General Conditions of the Contract for Construction.

F. In determining the amount of a Contract Price adjustment, the parties shall apply the following methods, as appropriate:

1. Change in Work: The Owner and Contractor shall negotiate in good faith and attempt to agree upon the value of any change (extra or decrease) in Work prior to the issuance of a Change Order covering said Work. Such Change Order shall set forth the corresponding adjustment to the Contract Price. In the event the Owner and the Contractor are unable to agree, the Owner shall grant an equitable adjustment in the Contract Price.
2. Emergency Work: In the event of emergency endangering life or property, the Contractor may be directed by the Designer to proceed on a time and material basis, whereupon the Contractor shall so proceed and keep accurately, in such form as may be required by the Designer, a correct account of costs together with all proper invoices, payrolls, and supporting data therefore.

G. Where the Contract Price is to be adjusted, the following limitations shall apply in determining the amount of adjustment:

1. In the case of extra or emergency work, the Contract Price shall not be increased by more than the reasonable, actual, and documented net cost of the extra or emergency work plus ten percent (10%) of such net cost on Work performed by the Contractor and five percent (5%) thereof on any subcontracted Work for overhead and profit combined.
2. In the case of a decrease in Work, the Contract Price shall not be decreased by less than the net cost of the deleted Work plus five percent (5%) of such direct net cost for profit and overhead.
3. The term 'net cost' as used herein shall include, as applicable, and shall be limited to, all direct labor, direct material, direct equipment, labor burden, sales taxes, shipping and handling charges, permits and fees, and insurance and bond premium adjustments, if any, attributable to the change. All other items of cost shall be considered as overhead and covered by the percentages allowed in sections A and B of this paragraph.

4. The Contractor shall provide worksheets or tabulations describing the method by which the direct net cost was calculated, and shall provide all data needed to support the calculation of the direct net cost, all in a form acceptable to the Owner.

H. Where the Contract Price is to be adjusted by negotiation, the Owner may authorize and designate the Designer to negotiate with the Contractor on behalf of the Owner; provided, however, any agreement reached between the Contractor and Designer shall be subject to approval by the Owner.

Article 27 Unforeseen Conditions

Should the Contractor encounter unforeseen conditions at the Project site materially differing from those shown on the Drawings or indicated in the Specifications or differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Agreement, the Contractor shall immediately, and in no event more than three days later, give notice to the Owner of such conditions before they are disturbed. The Owner and the Designer shall thereupon promptly investigate the conditions and if they find that they materially differ from those shown on the Drawings or indicated in the Specifications, they shall at once make such changes in the Drawings and/or Specifications as they may find necessary. Any increase or decrease in the Contract Price resulting from such changes shall be adjusted in the manner provided herein for adjustments as to extra and/or additional Work and changes. However, neither the Owner nor the Designer shall be liable or responsible for additional work, costs, or changes to the Work that could have been reasonably determined from any reports, surveys, and analyses made available for the Contractor's review or that could have been discovered by the Contractor through the performance of its obligations pursuant to the Contract Documents.

Article 28 Correction Of Work Before Final Payment

A. The Owner has the authority to stop or suspend work, and the Designer has the authority to order Work removed or to order corrections of defective Work or Work not in compliance with the Contract Documents where such action may be necessary to ensure successful completion of the Work.

B. Any work, materials, fabricated items, or other parts of the Work which have been found by the Designer to be defective or not in accordance with the Contract Documents shall be condemned and shall be removed from the Project by the Contractor, and immediately replaced by new Work in accordance with the Contract Documents at no additional cost to the Owner. Work or property of the Owner or others damaged or destroyed by virtue of such condemned Work shall be made good at the expense of the Contractor.

C. Correction of condemned Work described above shall be commenced by the Contractor within twenty-four (24) hours after notice from the Designer or the Owner and shall be pursued to completion. Should the Contractor fail to proceed reasonably with the above- mentioned corrections, the Owner may, three (3) days after the notice specified in the preceding sentence, proceed with correction, paying the cost, including costs of uncovering such condemned Work, of such corrections from amounts due or to become due to the Contractor.

D. Condemned Work removed shall be the property of the Contractor and shall be removed from the Project by him within ten (10) days after notice to remove it, and if not then removed, thereafter may be disposed of by the Owner without compensation to the Contractor and the cost of such disposal shall be deducted from amounts due or to become due to the Contractor.

E. Should the cost of correction of the Work and, if applicable, disposal of the condemned Work by the Owner exceed amounts due or to become due the Contractor, then the Contractor and the Contractor's sureties shall be liable for and shall pay to the Owner the amount of such excess.

Article 29 Correction Of Work After Substantial Completion; Warranties And Guaranties

A. Neither the final certificate, Final Payment, occupation of the premises by the Owner, nor any provision of the Contract Documents, nor any other act or instrument of the Owner or the Designer shall relieve the Contractor from responsibility for negligence, defective material or workmanship, or failure to comply with the Contract Documents.

B. The Contractor shall, at the Contractor's sole cost and expense, make all necessary repairs, replacements, and corrections of any nature or description, interior or exterior, structural or non-structural, that shall become necessary by reason of defective workmanship or materials which appear within a period of one (1) year from the date of Substantial Completion; provided, however that notwithstanding the preceding, if any longer guarantee period is specified for any particular materials or workmanship under the Contract Documents, or under any subcontract, or in connection with any manufactured unit which is installed in the Project, or under the laws of the State of North Carolina, the longer guarantee period shall govern.

C. If, within any guarantee period, repairs or changes are required in connection with the Work, which are rendered necessary as the result of the use of materials, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the Contract Documents, the Contractor shall, promptly upon receipt of notice from the Designer and without expense to the Owner:

1. Completely repair or replace the Work so that it conforms to the Contract Documents;
2. Correct all defects therein;
3. Make good all damage which, in the opinion of the Designer, is the result of the use of materials, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the Contract Documents; and
4. Make good any Work or material, or any equipment or contents disturbed in fulfilling any such guarantee.

D. If, in fulfilling the requirements of the Contract Documents or of any guarantee embraced therein or required thereby, the Contractor disturbs any work, facility, premises, or construction belonging to the Owner, the Contractor shall restore such disturbed work to a condition satisfactory to the Owner, and shall guarantee such restored work to the same extent as if it were Work under the Contract Documents.

E. If the Contractor, after notice, fails to proceed promptly to comply with the terms of the guarantee, the Owner may have the defects corrected, and the Contractor and the Contractor's sureties shall be liable for all expenses incurred. "Promptly" is defined as within twenty-four (24) hours for systems necessary to normal operation of the building and within seventy-two (72) hours for all other items. All special guarantees applicable to definite parts of the Work that may be shown in or required by Contract Documents shall be subject to the terms of this paragraph during the first year of the life of such special guarantee. Manufacturer's standard guarantees or warranties which do not comply with the time limit specified herein shall be extended by the Contractor automatically without further action on the part of the Owner or the Designer.

F. In the eleventh calendar month after the date of Substantial Completion, and at the request of the Owner, the Contractor, the Owner and the Designer shall make an inspection of the Work for the purpose of identifying defective workmanship and/or materials. If the Contractor, having been requested to do so by the Owner, fails to participate in such inspection, the Contractor shall be conclusively bound by any decision or ruling by the Designer as to any defective workmanship or material and as to the Contractor's responsibility for its repair or replacement.

Article 30 Owners Right To Do Work

A. If, during the progress of the Work or during any period of guarantee, the Contractor fails to prosecute the Work properly or to perform any provision of the Contract Documents, the Owner, after three (3) days written notice to the Contractor from the Designer, or from the Owner after Final Payment, may perform or have performed that portion of the Work and may deduct the cost thereof from any amounts due or to become due the Contractor. Notwithstanding any action by the Owner under this paragraph, all warranties and bonds given or to be given by the Contractor shall remain in effect or shall be given by the Contractor.

B. Should the cost of such action by the Owner exceed the amount due or to become due the Contractor, the Contractor and his sureties shall be liable for and shall pay to the Owner the amount of such excess.

Article 31 Partial Payments

A. Payments shall follow Guilford County Policy per Guilford County's general Terms and Conditions.

B. Schedule of Values – before the first application for payment ("Application for Payment"), the Contractor shall submit to the OWNER a schedule of values ("Schedule of Values") allocating the Contract Sum to the various portions of the Work and to the portions of the Work performed by each Subcontractor. The Schedule of Values shall contain single line item entries, identified for each major item of Work and each subcontracted item of Work, referenced to the number and titles of the specification section applicable for each item. The Schedule of Values shall be prepared on a form as set forth by the OWNER or on another form approved by the OWNER.

C. Schedule of Allowances – a Schedule of Allowances shall be submitted with all pay requests in accordance with SECTION 01 21 00-ALLOWANCES, SCHEDULE OF ALLOWANCES.

D. Within thirty (30) days after his initial receipt of the Construction Agreement for signatures, the Contractor shall submit to the Designer a Schedule of Values. The Schedule of Values shall indicate the value of the Work, including applicable overhead and profit, for each Division and section of the Project Specifications. The Designer and Owner shall be provided with the Contractor's estimate papers, Subcontractor agreements, supplier quotes, or other documents substantiating these values if so requested in writing by the Designer. The Contractor shall provide the requested documentation within seven (7) days after receipt of the Designer's written request. The Schedule of Values shall be subject to approval by the Owner, and if the Owner and the Contractor cannot agree upon the Schedule of Values, the Designer shall prepare it, and the Schedule of Values as prepared by the Designer shall be binding on the Owner and the Contractor. No Request for Payment shall be certified by the Designer until the Designer has issued approval of said Schedule of Values.

E. Not later than the fifth (5th) day of each calendar month the Contractor shall submit to the Designer a Request for Payment for Work done during the previous calendar month. The Request for Payment shall be in form of AIA Document G702 (latest edition) and shall show substantially the value of Work done (including the value of material delivered to the Project or stored by the Contractor at another site, subject to the conditions hereinafter set forth) during the previous calendar month, and shall sum up the financial status of the Work with the following information:

- Total Contract Price, including any adjustment thereto made pursuant to the Contract Documents
- Value of Work completed and materials properly stored to date
- Less amount retained
- Less previous payments
- Current amount due
- Balance remaining

F. The Contractor, upon request of the Designer, shall substantiate the request with invoices, vouchers, payrolls, or other evidence.

G. When payment is requested or made on an account of stored materials, such materials must be stored on the Owner's property at such places and in such a manner as may be designated by the Designer. However, in the sole discretion of the Owner, with permission in writing from the Designer and Owner and under such circumstances as may be determined by the Owner, such materials may be stored in a bonded warehouse. The location and conditions for storage of such materials away from the Owner's property in a bonded warehouse shall be within the sole discretion of the Owner. Requests for Payment on account of stored materials shall be accompanied by paid invoices, bills of sale, warehouse receipts, or other documentary evidence establishing Owner's title to such materials, evidence that the stored materials are insured against loss and damage, and such other documentation as required by the

Designer. Responsibility for the quantity, quality, and condition of such stored materials, whether stored on the Owner's property or away from the Owner's property, shall remain with the Contractor regardless of ownership or title. No payment shall be made on account of materials stored in a bonded warehouse unless the Contractor has acquired written permission from the Designer for such storage of materials and has complied with all conditions set forth in such permission regarding such storage of materials in a bonded warehouse.

H. Any Request for Payment received by the Designer on or before the fifth (5th) of the calendar month shall be certified for payment or returned for re-submission to the Contractor on or before the fifteenth (15th) of the calendar month. The Designer's certification shall be for the amount which was requested or that which the Designer has decided was justly due, and shall state in writing to the Contractor and Owner the reasons for withholding payment of any or all of the amount requested.

I. The Designer may fail to certify all or part of any payment requested for any of the following reasons:

1. Defective Work not corrected.
2. Suits, actions, or claims of any character filed against the Contractor, or due to the operations of the Contractor, or information or notice that a suit, action, or claim will be filed or has been made.
3. Information or notice that a Subcontractor or a supplier has not received payment.
4. The balance unpaid of the Contract Price is insufficient to complete the Work in the judgment of the Designer or Owner.
5. Damage to the Owner or another contractor.
6. Inability of the Contractor to meet a Completion Date, including an anticipated failure to meet a Completion Date entitling the Owner to withhold anticipated Liquidated Damages.
7. Failure to furnish Submittal as required by the Contract Documents on a timely basis in accordance with the Submittal Register.
8. Such other reason as to the Designer may appear prudent, proper, or equitable. When grounds for withholding certification have been corrected, the Designer shall so certify to the Owner and the Owner shall make any payment due with respect to such certification as a part of his next payment after such certification.

J. No certificate issued or progress payment made shall constitute an acceptance of the Work or any part thereof.

K. The amount certified by the Designer for payment shall be ninety percent (90%) of the value of Work completed and materials stored since the Designer's last certification as shown on the Request for Payment, less any amounts not certified, and this amount shall be paid by the Owner on or before the last business day of the month, but payment shall not be past due until not paid within fifteen (15) days thereafter.

Article 32 Final Payment

A. If the Work of the Contractor is limited to demolition, pilings, caissons and/or structural steel, the remaining unpaid balance of the Contractor’s Contract Price, less a sum equal to five-tenths percent (0.5%) of the Contract Price, shall be paid within sixty days following receipt of the following documents, all of which must be received before payment shall become due: (i) request for payment from the Contractor; (ii) receipt of consent from the Contractor’s surety to the payment; and (iii) approval or certification from the Designer that the work performed by the Contractor is acceptable and in accordance with the Contract Documents.

B. Except as set forth in paragraph A above, within forty five days after Substantial Completion of the Project, the remaining unpaid balance of the Contract Price shall be paid to the Contractor, less an amount equal to two and one-half times the value of punch list work or other work remaining to be completed or corrected, as reasonably estimated by the Owner.

C. Upon Substantial Completion, the Designer shall prepare and submit to the Contractor a deficiency list identifying all portions of the Work which are known by the Designer at that time to be incomplete or defective. Within thirty (30) days of receipt of this deficiency list, the Contractor shall complete and

correct all items on that list along with all other Work required to achieve Final Completion of the Work. At any time prior to completion of the period of warranty, the Designer may submit to the Contractor a supplemental deficiency list, in which case the Contractor shall complete or correct any and all new items identified on the Supplemental deficiency list within the time period stipulated.

D. Final Payment of any remaining balance of the Contract Price shall not be due to the Contractor until the Contractor achieves Final Completion of the Project.

E. The making and acceptance of Final Payment shall constitute a waiver of all claims by the Owner except:

1. Claims arising from unsettled liens or claims against the Contractor.
2. Defective Work or materials appearing after Final Payment.
3. Failure of the Contractor to perform the Work in accordance with the Contract Documents.
4. As conditioned in the Performance Bond.
5. Claims made prior to Final Payment which remain unsettled.
6. Claims for recovery of overpayment based upon incorrect measurement, estimate, or certificate.

F. The making and acceptance of Final Payment shall constitute a waiver of all claims by the Contractor except those claims previously made in writing and not finally resolved.

G. The Designer shall not authorize Final Payment until all of the Work under the Contract Documents has been certified by the Designer as completed, proper and suitable for occupancy and use, and has been approved by all federal, state and local agencies having jurisdiction.

H. The final Request for Payment shall be identified on its face as such and shall be presented by the Contractor to the Designer within thirty (30) days of completion of the Work. Final payment of the retained amount due the Contractor shall be made by the Owner within thirty (30) days after the later of (i) full and Final Completion of all Work required by the Contract Documents, and certification of such Work; (ii) submission of the affidavits of other documentation required by Article 33; (iii) submission by the Contractor of a Request for Payment identified on its face as final and including the Designer's certification.

Article 33 Contractor, Subcontractor And Supplier Affidavit

A. The Contractor shall comply with the applicable laws and regulations of the state of North Carolina regarding the liability of the OWNER for mechanics' liens.

B. The Final Payment due the Contractor on account of the Contract Documents shall not become due until the Contractor has furnished to the Owner through the Designer: (A) an affidavit by the Contractor signed, sworn, and notarized to the effect that all payments for materials, services, or for any other reason in connection with the Work or performance of the Contract Documents have been satisfied and that no claims or liens exist against the Contractor in connection with the same; (B) affidavits from each Subcontractor and supplier signed, sworn, and notarized to the effect that (i) each such Subcontractor or supplier has been paid in full by the Contractor for all Work performed and/or materials supplied by him in connection with the Project, and (ii) that all payments for materials, services, and for any other reason in connection with the subcontract or supply contract have been satisfied and that no claims or liens exist against the Subcontractor or supplier in connection therewith; and (C) the written consent of the Contractor’s sureties to Final Payment. In the event that the Contractor cannot obtain an affidavit, as required above, from any Subcontractor or supplier, the Contractor shall state in the Contractor’s affidavit that no claims or liens exist against such Subcontractor or supplier to the best of the Contractor's knowledge, and that if any appear afterwards, the Contractor shall save the Owner harmless for all costs and expenses, including attorneys fees, on account thereof.

Article 34 Contractor And Subcontractor Relationships

A. RELATIONS: The Contractor agrees to bind every Subcontractor and every Subcontractor shall agree to be bound by the terms of the Contract Documents.

B. Within thirty (30) days after initial receipt of the Construction Agreement for signatures the Contractor shall submit to the Designer and Owner for acceptance a current list of the names of Subcontractors and such other persons and organizations (including those who are to furnish materials or equipment fabricated to a special design) proposed for any and all portions of the Work. The Contractor shall provide this list at this time even if the Contractor was required to submit a list of proposed Subcontractors with the Contractor's bid. The Designer shall promptly reply to the Contractor in writing stating whether or not the Owner or the Designer, after due investigation, has objection to any such proposed person or entity or if it needs additional information to evaluate the persons on the list. Failure of the Designer to reply within ten (10) days after the Contractor has furnished all required information shall constitute notice of no objection.

C. The Contractor shall not contract with any such proposed person or entity to whom the Owner or the Designer has made reasonable objection. If the Designer or Owner has reasonable objection to any such proposed person or entity, the Contractor shall submit a substitute to whom the Owner and the Designer have no reasonable objection. The Contractor shall make no substitution for any Subcontractor, person, or entity previously allowed without first notifying the Designer and Owner in writing and no substitution may be made if the Owner or Designer makes a reasonable objection to such substitution.

D. The Contractor agrees that the terms of the Contract Documents, including all portions thereof, shall apply to all Subcontractors of the Contractor as if they were the Contractor, and that the Subcontractors of the Contractor shall, by means of their subcontracts, be bound by all the terms of the Contract Documents including, but not limited to, Article 26 of these General Conditions.

E. Payments to Subcontractors shall be made in accordance with the provisions of N.C. Gen.Stat. §143-134.1.

Article 35 Use Of Premises

A. The Contractor shall confine apparatus, the storage of materials, the operations of workers, and the disposal of material to limits indicated by law, ordinances, permits, and directions of the Designer, if any.

B. The Contractor shall not load or permit any part of the Work to be loaded with a weight that will endanger its safety, intended performance, or configuration.

C. The Contractor shall enforce all of the Designer's instructions, including, but not limited to, those regarding signs, advertisements, fires, eating, and smoking.

Article 36 Dispute Resolution

A. The laws of the State of North Carolina shall apply to the interpretation and enforcement of this Agreement. Any and all suits or actions to enforce, interpret, or seek damages with respect to any provision of, or the performance or nonperformance of, this Agreement shall be brought in the General Court of Justice of North Carolina sitting in Guilford County, North Carolina, and it is agreed by the parties that no other court shall have jurisdiction or venue with respect to such suits or actions. Appendix A shall be a part of the Contract Documents. Prior to initiating an action under this Article, any party to this Agreement shall initiate the mediation process as provided in Appendix A to these General Conditions of the Contract for Construction.

B. Any person or firm that expressly or impliedly agrees to perform labor or services or to provide material, supplies, equipment, work, performance or payment bonds, insurance or indemnification for the construction of the Project or the Work shall be deemed a party to this Agreement solely for the purpose of this Article. The Contractor, by means of its subcontracts, shall specifically require its Subcontractors to be bound by this Article.

Article 37 Taxes

A. The Contractor is to include in the Contract Price and shall pay all taxes assessed by any authority on the Work or the labor and materials used therein. The Contractor shall maintain all tax records during the life of the Project and furnish the Owner with a complete listing of all taxes paid by taxing authority, invoice number, date, amount, etc. in a form acceptable to the Owner. The Contractor is required to maintain a file showing taxes paid on the Project for three (3) years after Final Payment or turn said documents over to the Owner for his files.

B. The following is a list of requirements to be followed by the Contractor in maintaining proper records and reporting the North Carolina Sales and Use Tax and Local Sales and Use Tax. The Contractor shall comply fully with the requirements outlined below, in order that the Owner may recover the amount of the tax permitted under the law.

1. It shall be the Contractor's responsibility to furnish the Owner documentary evidence showing the materials used and sales and use tax paid by the Contractor and each of his Subcontractors. Such evidence shall be transmitted to the Owner with each pay request irregardless of whether taxes were paid in that period.
2. The documentary evidence shall consist of a certified statement by the Contractor and each of the Contractor’s Subcontractors individually, showing total purchases of materials from each separate vendor and total sales and use taxes paid to each vendor. Certified statements must show the invoice number, or numbers, covered, and inclusive dates of such invoices.
3. Materials used from Contractor's or Subcontractor's warehouse stock shall be shown in a certified statement at warehouse stock prices.
4. The Contractor shall not be required to certify the Subcontractor's statements.

Article 38 Operation Of Owner Facilities

The Contractor agrees that all Work done under the Contract Documents shall be carried on in such a manner so as to ensure the regular and continuous operation of the adjoining or adjacent facilities. The Contractor further agrees that the sequence of operations under the Contract Documents shall be scheduled and carried out so as to ensure said regular and continuous operation. The Contractor shall not close any areas of construction until so authorized by the Designer. The Contractor shall control operations to assure the least inconvenience to the public. Under all circumstances, safety shall be the most important consideration.

Article 39 Third Party Beneficiary Clause

It is specifically agreed between the parties executing the Agreement that, hereof, and that exception only, the Contract Documents and the provisions therein are not intended to make the public, or any member thereof, a third-party beneficiary of the Agreement, or to authorize anyone not a party to the Contract Documents to maintain a suit for personal injuries or property damage pursuant to the terms of provisions of the Contract Documents.

Article 40 Termination By The Owner For Cause

If the Contractor fails to begin or complete the Work under the Contract Documents within the time specified, or fails to perform the Work with sufficient labor and equipment or with sufficient materials to insure the prompt completion of said Work, or shall perform the Work unsuitably or shall discontinue the prosecution of the Work for three (3) days, or if the Contractor shall become insolvent, be declared bankrupt, commit any act of bankruptcy or insolvency, allow any final judgment to stand against the Contractor or its affiliated companies unsatisfied for a period of forty-eight (48) hours, make an assignment for the benefit of creditors, or for any other cause whatsoever shall not carry on the Work in an acceptable manner, the Owner may give notice in writing to the Contractor and the Contractor’s sureties of such delay, neglect, or default, specifying the same, and if the Contractor within a period of three (3) days after such notice shall not proceed in good faith and with reasonable speed to correct such delay, neglect, or default in accordance with such notice, the Owner shall have full power and authority, to the extent permitted by law, without violating the Contract Documents, to take the prosecution of the Work out of the hands of the Contractor, to appropriate or use any or all materials and equipment at the Project as may be suitable and acceptable, and may enter into an agreement for the completion of the Work or pursue such other methods as in the Owner's opinion shall be necessary or

appropriate for the completion of the Work in an acceptable manner. All costs and charges incurred by the Owner in proceeding in accordance with the preceding sentence, including attorney's fees, and all costs incurred by the Owner in completing the Work shall be deducted from any money due or which becomes due the Contractor. If such costs and expenses incurred by the Owner shall be less than the sum which would have been payable under Contract Documents if it had been completed by the Contractor, then the Contractor shall be entitled to receive the difference, but if such costs and expenses shall exceed the sum which would have been payable under the Contract Documents, the Contractor and the Contractor's surety shall be liable to the Owner for and shall pay to the Owner the amount of such excess.

Article 41 Termination Or Suspension By The Owner For Convenience

A. The Owner may, without cause, order the Contractor to terminate, suspend, delay, or interrupt the Work in whole or in part for such period of time as the Owner may determine.

B. If the Contractor is subsequently ordered by the Owner to resume the Work, any cost or expenses to which the Contractor may be entitled by reason of the suspension, delay, or interruption shall be recovered by means of a Change Order and the Contract Construction Schedule shall be adjusted.

C. The Owner shall terminate the Work or portion thereof by written notice when the Contractor is prevented from proceeding with the Work as a direct result of an executive order of the President with respect to the prosecution of war or in the interest of national defense.

D. In the event of termination by the Owner under this Article, the Contractor shall be entitled to receive the reasonable and documented direct costs incurred prior to termination, including the cost of materials purchased for the Work which purchases cannot be canceled or which material cannot reasonably be used by the Contractor on other work, and the cost of closing down the Project in a safe and efficient manner, plus ten percent (10%) thereof for overhead and profit, subject to the following conditions:

1. When the Contract is terminated before completion of all items of Work, payment shall be made for the actual number of units or items of Work completed at the applicable contract prices, or as mutually agreed for items of Work partially complete. If a mutual agreement cannot be reached, the Owner shall have the authority to make such equitable adjustment as it deems warranted and the Final
2. Payment shall be made accordingly.
3. Reimbursement for organization of any Work and moving equipment to and from the job shall be considered when not otherwise provided for in the Contract Documents where the volume of completed Work is too small to compensate the Contractor for those expenses under unit prices. If a mutual agreement cannot be reached, the Owner will have the authority to make such equitable adjustments as it deems warranted and the Final Payment will be made accordingly.
4. Materials obtained by the Contractor for the Work that have been inspected and accepted by the Designer and that are not incorporated in the Work shall, at the request of the Contractor, be purchased from the Contractor at the Contractor's actual cost as shown by receipted bills and actual costs records at such points of delivery as may be determined by the Owner.
5. No payment shall be made by Owner to Contractor except as herein above provided. No claim for loss of anticipated profits shall be considered or allowed.
6. Termination of the Contract shall not relieve the Contractor of his responsibilities for any completed portion of the Work nor shall it relieve his sureties of their obligation for and concerning any just claims arising out of the Work performed.

The Contractor shall not be entitled to any other compensation, including compensation for lost profit, lost opportunity, or any other direct or consequential cost, loss, or damage.

END OF DOCUMENT 00821

DOCUMENT 00938 – REQUEST FOR INFORMATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work Specified in This Section:
1. This Section specifies administrative and procedural requirements for disposition of Request for Information (RFI's) during the Construction Phase.

B. Related Work Specified Elsewhere:
1. General Conditions Of The Contract (00820)

1.2 SUBMITTALS

A. Submit each request (RFI) on the form included in this Section, and in accordance with procedures stipulated below.

1. Identify the issue, fabrication, or installation method in question in each request. Include related Specification Section and Drawing numbers. Provide complete documentation stating the issue. Include copies of Product Data, Drawings, descriptions of products, fabrication details, installation procedures or other information to help clarify the Contractor's request.

B. Submit only one request on each form.

C. Email RFI form to Walter Robbs Callahan & Pierce Architects, PA to the attention of: Matt Messick at mattm@walterrobbs.com or Clark Pierce at clarkp@walterrobbs.com.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 CONDITIONS

A. Submit any such requests to the Architect as early as possible so as to cause no delay in the progress of the Work and enough in advance to allow the Architect reasonable and adequate time to provide a full and proper response. If the information being requested from the Architect can not be reasonably determined by information contained within the Contract Documents, and/or original construction documentation, then the Contractor shall reimburse the Architect for time spent researching the RFI at the Architect's current hourly rate.

3.2 ARCHITECTS ACTION:

A. After receipt of the request for information, the Architect may request additional information or documentation necessary for evaluation of the request. After receipt and review of all pertinent information and documentation, the Architect will issue his response. Such response may be written form or drawings as the Architect shall determine.

DOCUMENT 00938 – REQUEST FOR INFORMATION (RFI)

Contractor RFI #: **Date:**

Submitted By:

Attention: Walter Robbs Callahan & Pierce Architects, PA
Matt Messick at mattm@walterrobbs.com or Clark Pierce at clarkp@walterrobbs.com.

Subject:

Specification Reference:

Drawing Sheet Number/Detail Reference:

INFORMATION REQUESTED

Signed:_____

RESPONSE **By:** **Date:**

☐ See Drawings/Specifications:

☐ See Addenda to be issued:

☐ Other

☐ See attachments

END OF DOCUMENT 00938

FORM OF BID BOND

KNOW ALL MEN BY THESE PRESENTS THAT _____ _____ as principal, and _____, as surety, who is duly licensed to act as surety in North Carolina, are held and firmly bound unto the State of North Carolina through _____ as obligee, in the penal sum of _____ DOLLARS, lawful money of the United States of America, for the payment of which, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Signed, sealed and dated this ____ day of _____ 20____

WHEREAS, the said principal is herewith submitting proposal for _____ and the principal desires to file this bid bond in lieu of making the cash deposit as required by G.S. 143-129.

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION is such, that if the principal shall be awarded the contract for which the bid is submitted and shall execute the contract and give bond for the faithful performance thereof within ten days after the award of same to the principal, then this obligation shall be null and void; but if the principal fails to so execute such contract and give performance bond as required by G.S. 143-129, the surety shall, upon demand, forthwith pay to the obligee the amount set forth in the first paragraph hereof. Provided further, that the bid may be withdrawn as provided by G.S. 143-129.1

_____(SEAL)

_____(SEAL)

_____(SEAL)

_____(SEAL)

_____(SEAL)

Place Legible Copy of Photo ID Here

CONSENT TO BACKGROUND CHECK

Last Name	First Name	Middle Name	Date of Birth	List All Addresses for the Previous Four Years

I hereby acknowledge and consent to allow Guilford County ("County") to conduct a background check on me prior to, and necessary for approval to, work on County property. I further consent to providing the County with a copy of my current driver's license or State-issued Identification card to facilitate in conducting the background checks. Background checks include criminal record and driver's license checks. I also agree to provide any updated information to the County and/or my employer immediately regarding changes to my criminal record and driver's license subsequent to the County's initial criminal record and driver's license checks.

CONSENT AND ACKNOWLEDGMENT:

_____

Printed Name

_____

Authorizing Signature

TLOCRC		
NCDOC		
NCAOC		
WARRANTS		

NOTES

Guilford County Security Use Only

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Guilford County Law Enforcement Center Renovation.

1. Project Location: 401 W. Sycamore Street, Greensboro, NC 27401
2. Owner: County of Guilford, North Carolina.
3. County Department: Facilities and Parks

B. Architect Identification: Walter Robbs Callahan & Pierce Architects, PA

C. Guilford County Facilities is seeking Proposals from individuals or firms interested in providing services for the renovation of the existing Guilford County Law Enforcement Center (Old Jail) at 401 W. Sycamore Street, Greensboro, NC 27401. The renovated building will be converted into office space for the Sheriff's administration operation and other law enforcement offices.

The building was constructed in 1974 consists of approximately 113,400 sf and is a multi-story (9 levels) building. The exterior facade is precast concrete panels and cast-in-place concrete. Existing structure is cast-in-place concrete throughout except portions of the lower two levels which consist of structural steel. Work includes demolition of all walls (reinforced CMU & concrete) on the upper six levels and major demolition of drywall partitions on the main level. Demolition also includes window removal, the main entrance and removal of the majority of existing building systems including plumbing, mechanical, electrical and fire protection.

New construction includes new front entrance, interior drywall partitions, doors/frames/hardware; floor wall, and ceiling finishes; casework, elevator modernization, new aluminum storefront and glazing and new single-ply roofing system. Work also includes new HVAC systems, new plumbing systems, new security cameras, and access control, CTV, data, fire alarm and new electrical/lighting systems.

1.3 CONTRACT

A. This work will be under a General construction contract.

1.4 WORK COMPLETION

A. The Work shall be complete within 420 Calendar days the contracted number of days, commencing from the date of the Owner's written notice to proceed

1.5 USE OF PREMISES

A. General: Contractor shall have use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises will be limited to work described in the Project Manual and Drawings.

1.6 WORK UNDER OTHER CONTRACTS

A. Separate Contract: In the event the Owner awards separate contracts for performance of certain construction operations at Project site. Those operations may be conducted simultaneously with work under this Contract.

B. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

1.7 WORK DONE BY OWNER

A. The Owner will furnish and install the following work, generally. This itemization is not totally inclusive.

1. Fire extinguishers and mounting brackets.

1.8 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 33-division format and CSI/CSC's "Master Format" numbering system.

1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections applicable to the Contract Documents.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred, as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 21 00 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing allowances required ***when certain items are identified in the Contract Documents as allowances.***

1. Allowances are established in lieu of additional requirements and to defer selection of actual materials, equipment, and demolition method to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Unit-cost allowances.
3. Quantity allowances.
4. Contingency allowances.

C. Related Sections include the following:

1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders for allowances.
2. Division 1 Section "Unit Prices" for procedures for using unit prices.
3. Division 1 Section "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.
4. Divisions 2 through 33 Sections for items of Work covered by allowances.

1.3 SELECTION AND PURCHASE

A. Fourteen (14) days after award of the Contract, advise Architect of the date when final selection and purchase of each materials, equipment, and demolition method described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain submittals for each allowance for use in making final materials and or demolition method selections. Include recommendations that are relevant to performing the Work.

C. Purchase materials, equipment and demolition method selected from the designated supplier.

1.4 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 LUMP-SUM, UNIT-COST, AND QUANTITY ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner under allowance and shall include taxes, freight, and delivery to Project site.

B. Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Include the following lump sum allowances:
1. The following lump sum allowances shall be included in the Base Bid. If the actual cost is more than or less the allowance, the Contract Price will be adjusted up or down accordingly when the actual coat is determined. Adjustments in the Contract Price will be made by Change Order in accordance with the General and Supplementary General Conditions of the Contract. Call allowances include all expenses associated with the work listed.
   a. AT&T: $15,000.00
   b. Time Warner Cable: $5,000.00

D. Include the following Quantity Allowances:
1. EXCAVATION AND OFFSITE DISPOSAL OF UNSUITABLE SOIL & REPLACEMENT WITH OFFSITE BARROW BACKFILL/FILL COMPACTED – The contractor shall include in the base bid removal of 500 cubic yards of unsuitable soil underlying partial areas of the building and pavement areas and replacement with suitable materials from offsite. (500 cu. yds)
2. EXCAVATION AND OFFSITE DISPOSAL OF UNSUITABLE SOIL & REPLACEMENT WITH STONE – The Contractor shall include in the base bid removal of 300 cubic yards of unsuitable soil underlying partial areas of the building foundation and replacement with well compacted aggregate base course (ABC) (300 cu. Yds.)
3. Applicable unit prices entered on the Contractor’s bid form will be used to adjust the contract price in the event that less than or more than the specified quantity allowance is actually removed and replaced. Delivery tickets must be provided to verify all quantities delivered to the jobsite.

1.7 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

E. Contingency Allowance for the project shall be $350,000.

1.8 TESTING AND INSPECTING ALLOWANCES

A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.

B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.

C. Costs of services not required by the Contract Documents are not included in the allowance.

D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.9 UNUSED MATERIALS

A. Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, prepare unused material for storage by Owner when it is not economically practical to return the material for credit. If directed by Architect, deliver unused material to Owner's storage space. Otherwise, disposal of unused material is Contractor's responsibility.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. In the event that allowances are issued, a schedule of Allowances shall be submitted with all pay requests to include Allowance No., Allowance Description as specified in relevant Division Section and as shown on Drawings.

END OF SECTION 01 21 00

SECTION 01 23 00 - ALTERNATES AND UNIT PRICES

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes: Alternates to be submitted to Guilford County with Proposal.
   1. Submission procedures.
   2. Documentation of changes to Contract Sum/Price and Contract Time.

B. Related Documents: The Contract Documents, as defined in Section 01 10 00- Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

1.2 DEFINITIONS

A. Alternate: The net amount to be added to or deducted from the Base Proposal Price for work identified in Schedule of Alternates.

B. Unit Prices: The Price per unit or measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased. Unit prices include all necessary material, plus cost of delivery, installation, insurance, applicable taxes, overhead, and profit.

1.3 SUBMISSION REQUIREMENTS

A. Extent of Alternates:
   1. Determine the full extent of Work affected by proposed Alternates.
   2. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.
      a. Include as part of each Alternate, miscellaneous devices, accessory objects and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

B. Submission Form: Complete Schedule of Alternates AND Unit Prices below and attach to Proposal.
   1. Substitutions are permitted unless prohibited by a relevant specification section for that product or material. Submit a request for substitution for any manufacturer not named in accordance with Section 01 63 00.

C. Schedule: The Alternates consist of the items included, or attached and incorporated by reference in Section B, The Contract, B. 1500 Attachments. Specification Sections referenced in the Schedule contain requirements for materials and methods necessary to achieve the Work described under each Alternate.
   1. Alternates describe environmental requirements.

   2. Conform to Contract Documents for requirements for performance, appearance, workmanship and materials not modified under the Alternate Bids.

D. It is intended that each separate bid alternate shall be completely independent of each other bid alternate.

1.4 SELECTION AND AWARD OF ALTERNATES

A. Acceptance or Rejection: Alternates quoted on Schedule of Alternates and attached to Proposal will be reviewed and accepted or rejected at Guilford County's option. None, any, or all Alternates may be accepted or rejected by Guilford County.

B. Accepted Alternates will be identified in the Contract.

C. Some Alternates and respective pricing will survive the Contract and will remain valid for the period stated in the Schedule of Alternates below.

SCHEDULE OF ALTERNATES

A. Alternate No. 1: State the amount to be added to the Base Proposal Price to provide the interior upfit of Levels 3, 4, and 5, as shown on the drawings. Work to the building shell, (e.g. demolition of existing partitions, equipment, window replacement, perimeter insulation and GWB, etc.) is to be included in the Base Proposal Price. This Alternate will remain valid until submittal and approval of product data, and shop drawings.

Add:_____dollars

B. Alternate No 2: State the amount to be added to or deducted from the Base Proposal Price to provide Yale locks as scheduled in Section 08 71 00 in lieu of other specified equal manufactures. This Alternate will remain valid until submittal and approval of product data, and shop drawings.

Add:_____dollars or Deduct:_____dollars.

C. Alternate No 3: State the amount to be added to the Base Proposal Price to provide exterior cleaning of the building as outlined on the structural drawings. This Alternate will remain valid until submittal and approval of product data, and shop drawings.

Add:_____dollars.

D. Alternate No 4: State the amount to be added to the Base Proposal Price to remove all exterior precast concrete sealant joints, clean & prime joints and replace with new sealant and backer rod as specified in Section 07 90 00. This Alternate will remain valid until submittal and approval of product data, and shop drawings.

Add:_____dollars.

E. Alternate No 5: State the amount to be added to the Base Proposal Price to enlarge existing window openings on North & South Building Elevations. Price to include 16 enlarged openings per level on levels 3 thru 8. This Alternate will remain valid until submittal and approval of product data, and shop drawings.

Add:_____dollars.

F. Alternate No 6: State the amount to be added from the Base Proposal Price to Provide 5-year extended chiller warranty and service. This Alternate will remain valid until submittal and approval of product data, and shop drawings.

Add:_____dollars

G. Alternate No 7: State the amount to be added from the Base Proposal Price for the Distributed Antenna System to include 700 MHz coverage for FirstNet capability per Specification Section 28 05 37. This Alternate will remain valid until submittal and approval of product data, and shop drawings.

Add:_____dollars

SCHEDULE OF UNIT PRICES

1. Excavation and offsite disposal of unsuitable soil & replacement with offsite borrow backfill/fill compacted. _____/cu. Yds.
2. Excavation and offsite disposal of unsuitable soil & Replacement with compacted ABC Stone. _____/cu. Yds.
3. Data outlets _____/ea.
4. Power outlets _____/ea.
5. Exit lights _____/ea.
6. CTV outlets _____/ea.
7. Access control _____/ea.
8. Sprinkler head relocation _____/ea.
9. Fire alarm pull station _____/ea.
10. Fire Alarm horn/strobes _____/ea.
11. Window enlargement per Alternate No 4. _____/ea.
12. Exterior Exposed Aggregate Precast Concrete- surface and aggregate repair per structural description _____/sf.
13. Spray applied fireproofing _____/sf.

PART 2 – PRODUCTS
(NOT USED)

PART 3 – EXECUTION
(NOT USED)

END OF SECTION 01 23 00

SECTION 01 25 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Work Included in This Section:
   1. This section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections Specified Elsewhere:
   1. Allowances (01 21 00)

1.2 CHANGE OF CONTRACT PROPOSAL REQUEST (CCPR):

A. Prior to incorporation in a Change Order each proposed change in the Work, adjustment to the Contract Sum, or adjustment to the Contract Time will be identified as a Change of Contract Proposal Request (CCPR) each of which will be assigned by the Architect.

B. Change proposal requests are for pricing only. Do not consider them instruction either to stop work in progress or to execute the proposed change.

C. Proposals shall be submitted to the Architect in accordance with Document 00821, Article 16-CHANGE OF CONTRACT.

D. At the time of signing a Change Order, the Contractor shall notify his Surety that the Contract Sum has been changed by the amount of this Change Order and he shall furnish his Surety with a copy of the approved Change order.

E. Change Proposal Request Format:
   1. Use the format included at the end of this Section for submittal of CCPR's.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

SEE (CCPR) FORMAT NEXT PAGE

END OF SECTION 01 25 00

COST CHANGE PROPOSAL

Project	*Project No.*	*Modification No.*
Contractor	*Contract No.*	*RFP No.*

A. Scope of Change

B. For Change Work Performed Directly by the Undersigned Contractor:

1.	Direct Labor: (attach supporting detailed estimates w/ man-hours & rates. Include labor fringes.		$
2.	Insurance:	$	
3.	Materials and Equipment: (attach supporting detailed estimate with quantities and unit costs)		$
4.	Deduction of offsetting debit or credit for materials, labor, and equipment: (attach supporting estimate)		$
5.	Overhead: ____ % (max 10%)		$
6.	Profit: ____ % (max 10%)		$
7.	Other: _____	$	
8.	TOTAL DIRECT COST		$

C. For Change Work Performed by Subcontractors, per Proposals and Detailed Breakdowns attached: (excluding FICA/FUTA)

1.	Subcontractor Name:	Category of Work:	$
			$
			$
			$
			$
			$
			$
2.	Subtotal Subcontractor Amount (including All Subcontractor Costs):		$
3.	Contractor's Commission on Total Subcontractor Amount: ____ % (Do not exceed 10%)		$
4.	Other: _____		$
5.	TOTAL SUBCONTRACTED COST (C2 + C3 + C4):		$

D. Total Cost of this Change (B8 + C5):	$
E. Contract Time Extension in Calendar Days (Attach supporting Documentation):	

Contractor Authorization:

Printed Name of Person Authorized to Sign Proposal	*Signature*	*Date*

SECTION 01 31 00 - PROJECT COORDINATION

PART I - GENERAL

1.1 DESCRIPTION OF WORK:

A. Work Specified In This Section:

1. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:

   a. Coordination.

   b. Administrative and supervisory personnel.

B. Related Work Specified Elsewhere:

1. Project Meetings (01 31 50)

2. Submittals (01 33 00)

1.2 COORDINATION:

A. The Contractor shall:

1. Schedule the work of all sub-contractors; maintain a progress schedule for all sub-contractors for this project; notify the Architect of any changes in the progress schedule; and be responsible for providing adequate notice to all sub-contractors to insure efficient continuity of all phases of the project work.

2. Hold meetings with the various major sub-contractors as required to coordinate work and provide work progress reports.

3. The Contractor shall provide for scheduling of all testing as required by this contract. Such testing for each item shall be indicated on the construction schedule.

4. The Contractor shall coordinate the securing of all final certificates of inspection, the Certificate of Occupancy, and other inspections that may be required by authorities having jurisdiction over the Work. He shall deliver same to the Architect upon completion of the Work.

1.3 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General:

1. The Contractor shall Appoint a single representative, i.e. Project Manager, fluent in the English language, to be the single contact person with the Owner and/or Architect. The Project Manager shall have experience on at least two projects of similar scope, size and complexity.

2. The Contractor shall be responsible for supervising and expediting the project work with an on-site supreintendent in accordance with Document 00821, Article 5 paragraph F.

3. In addition to the Project superintendent, the Contractor shall give his superintendent enough support staff that his ongoing presence can be maintained on site so that errands to secure materials etc. will be carried out by others and others will receive deliveries to site.

4. The on site project superintendent shall have a minimum of five (5) years experience in facilities similar in scope to this project.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 01 31 00

SECTION 01 31 50 – PROJECT MEETINGS

PART I - GENERAL

1.1 DESCRIPTION OF WORK:

A. Work Included This Section:

1. This Section specifies administrative and procedural requirements for project meetings including but not limited to:
   a. Pre-Consturction Conference.
   b. Coordination Meetings.
   c. Progress Meetings.

B. Related Work Specified Elsewhere:

1. Project Coordination (01 31 00)
2. Progress Schedules (01 32 50)

1.2 PRE-CONSTRUCTION CONFERENCE

A. A pre-construction conference shall be scheduled by the Architect and held at the Project site or other convenient location after execution of the Agreement or Notice To Proceed, whichever comes first, and prior to commencement of construction activities.

B. Attendees:

1. The Owner, Architect, the Contractor(s), and its superintendent(s) shall each be represented at the conference by persons authorized to conclude matters relating to the Work.

C. Agenda:

1. Discuss items of significance that could affect progress including such topics as:
   a. Work sequencing.
   b. Safety.
   c. Security.
   d. Tentative Progress Schedule.
   e. Designation of responsible personnel.
   f. Procedures for processing CCPR’s and Change orders.
   g. Procedures for processing Applications for Payment.
   h. Submittals.
   i. Use of the premises.
   j. Staging areas.
   k. Housekeeping.

1.3 COORDINATION MEETINGS

A. The Contractor shall conduct project coordination meetings at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special Pre-installation meetings.

B. Bi-Weekly Progress Meetings

1. To enable orderly review of progress during construction and to provide for systematic discussion of problems, project meetings shall be held throughout the construction period.
2. The Contractor and his superintendent shall attend and participate the monthly project meetings.
3. The Owner will conduct the meetings and AE will compile minutes of each meeting and will distribute copies. The Contractor(s) shall distribute such other copies as required. The Contractor shall assign the same person to represent the Contractor at project progress meetings throughout the construction period.
4. Schedule Updating: Revise and update the construction schedule after each progress meeting where revisions to the schedule have been made or recognized, including all approved CCPR'S.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation meeting will be required for all major components of the Project, including bu not limited to, concrete, masonry, windows, storefront, roofing, and finishes. Contractor is to schedule meetings. Minutes are to be kept by the Contractor and distributed to all parties concerned. Architect and Engineer will be present. See individual specification sections for additiional requirements.

B. Do not proceed with the installation if the meeting cannot be successfully conducted. Initiate reconvene the meeting at the earliest feasible date.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 31 50

SECTION 01 33 00 - SUBMITTALS

PART 1-GENERAL

1.1 DESCRIPTION OF WORK

A. Work Included This Section:

1. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including but not limited to the following:

a. Submittal schedule.
b. Construction Method Description.
c. Daily construction reports
d. Shop Drawings
e. Produce data.
f. Samples.
g. Quality assurance submittals.
h. Schedule of values.
i. Request for information (RFI)
j. Electronic Submittals.

B. Administrative Submittals:

1. Refer to Division- I and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

a. Permits.
b. Applications for payment.
c. Performance and payment bonds.
d. Insurance certificates.
e. List of Subcontractors.

1.2 SUBMITTAL PROCEDURES

A. Submittal Preparation:

1. Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

2. Include the following information on the label for processing and recording action taken:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name and address of Contractor.
e. Name, phone number and address of subcontractor.
f. Number and title of appropriate Specification Section.

3. As a result of the Contractor's review, the Contractor shall indicate that the result of his review was:

a. "Reviewed and Approved"
b. "Reviewed and Disapproved"
c. "Reviewed - Revise and Resubmit"
d. "Reviewed - Approved As Noted"

B. If appropriate, and/or permitted by the Contract Documents, the Contractor may stamp the Submittal information “Received for Record Purposes only”, if no review of the material by the Contractor is required by the Contract Documents.

C. Provide a space aproximately 4” x 5” on the label or beside the title block on Shop Drawings to record the Contractor’s review and approval markings and the action taken.

D. Submittal Review by Contractor:

1. The Contractor is required to review each submittal, including, but not limited to, demolition method description and similar submittals.

2. Submittals on items, or materials, that are not specified or indicated on the drawings will be considered substitutions. and as such, must comply with provisions of Section 01 63 00 - Product Substitutions, of this Project Manual.

3. Following the Contractor review of the submittal, the Contractor will place a "review stamp" on each copy of each submittal, and sign, date and indicate action taken in conformance with the "Submittal Preparation" sub-section of this Section. The same information indicated on the Contractor's review stamp will also be indicated on the "Submittal Transmittal" form included with this Section.

4. By approving and submitting demolition method descriptions and similar submittals, the Contractor represents that he has determined, or will do so, the suitability of, and has checked and coordinated the information contained within such submittals, with the requirements of the Work and the Contract Documents.

5. The responsibility for coordinating the Shop Drawings, including technical data, capability (warranted and implied), etc. shall be the sole responsibility of the Contractor. The coordination between subcontractor and/or materials supplier shall be the responsibility of each Contractor/Prime Contractor.
The Project Coordinator, as defined in the Specifications, shall be responsible to supervise this activity.

   a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

6. Submittals that do not comply with provisions of this sub-section will be returned not reviewed, not logged and will be considered non-responsive.

7. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittal.

   a. No extention of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

8. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect using a transmittal form. The Architect will not accept submittals received from source other than the Contractor.

E. Partial Submittals:

1. Partial or incomplete submittals are not acceptable. Any submittal received by the Architect that does not contain all portions required by each Section of the Specification, will be returned not reviewed, not logged and will be considered non-responsive.

2. Exceptions will be considered on a case by case basis, such as on multi-level, or multi phased projects. Requests for exceptions must be submitted in writing by the Contractor for evaluation and response, a minimum of 30 days prior to the submittal date indicated on the Contractor's Approved/updated Submittal Schedule.

F. Submittal Review by Architect:

1. The Architect will review each of the Contractor's submittals one initial time, and, should resubmittal be required, one additional time to verify that the reason(s) for re-submittal have been addressed by the Contractor and corrections made. Any review required by the Architect other than the two (2) indicated above, will be considered additional scope of work for the Architect, and the Contractor shall reimburse the Owner for all costs incurred, including the cost of the Architect's services made necessary to review such additional re-submittals.

G. Schedule of Submittals:

1. Contractor shall prepare and submit to Architect a schedule of shop drawings, product data, samples, and other submittals as required in the General and Supplementary General Conditions and the Contract Documents. Schedule shall fix dates for submission and the lead-time for each submittal as related to requirement for return-receipt of submittal to expedite delivery of material to maintain Contractor's Construction Schedule.

2. It is to be understood that this schedule will be subject to change from time to time in accordance with the progress of the work. Revise the schedule after each meeting or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

3. No work shall be performed on work involving submittals until the Architect's written approval has been received.

H. Daily Construction Reports:

1. Prepare a daily construction report, including but not limited to, the following information concerning events at the site, and submit duplicate copies to the Architect at weekly intervals.

List of subcontractors at the site
Approximate count of personnel at the site
High and low temperatures, general weather conditions, including amount of rainfall. (If zero note this on the report)
Meetings and significant decisions
Stoppages, delays, shortages, and losses
Orders and requests of governing authorities
Change orders received, implemented
Services connected, disconnected
Equipment or systems tests and startups
WS/ FCS Sedimentation and Pollution Control Reports

I. Shop Drawings:

1. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

2. Shop drawing include fabrication and installation Drawings, setting, diagrams, schedules, patterns, templates and similar Drawings.

J. Product Data:

1. Collect product data into a single submittal for each element of construction or system. Mark each copy to show applicable choices and options. Where printed product data includes information on several products that are not required, mark copies to indicate applicable information. Product data should include, but is not limited to, the following information:

    Manufacturer's printed recommendations
    Compliance with trade association standards
    Compliance with recognized testing agency standards
    Application of testing agency labels and seals
    Notation of dimensions verified by field measurements (when applicable)

K. Samples

1. Submit samples for review of size, kind, color, pattern, and texture. Submit samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component installed.

2. Refer to other Specification Sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

L. Quality Assurance Submittal:

1. Submit quality -control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, test reports, and other quality-control submittals as required under this Section and as required in other Sections of these Specifications.

M. Schedule of Values:

1. The Schedule of Values required by the General and Supplementary General Conditions shall be submitted on AIA Document G703 and shall be divided into the sixteen divisions included in the Specifications and itemized in sufficient detail such that the Architect can fairly evaluate the subsequent pay requests submitted by the Contractor.

N. Request for Information (RFI):

1. In the event that the Contractor discovers what he considers to be a contradiction in the Contract Documents, or feels that he requires more information than is provided by the Contract Documents, or needs clarification or an interpretation of information included in the Contract Documents, he shall submit a Request For Information (RFI) to the Architect clearly describing the information that is required and clearly referencing the specific documents and locations in the documents involved.

2. Responses from the Architect to RFI's will not change any requirements of the Contract Documents. In the event the Contractor believes that a response to a RFI will cause a change in the requirements of the Contract Documents, the Contractor shall immediately give written notice to the Architect, stating that the Contractor considers the response to

be a Change Order. Failure to give such written notice shall waive the Contractor's right to seek additional time or cost related to the RFI.

3. All RFI's shall be on a printed form approved by the Architect. The form shall state the contractor's name, date, project name, RFI number, brief subject description, specification reference (section & page), drawing reference (sheet & detail number), room number (if applicable) and request narrative. The contractor shall sign and date each request. The form shall have sufficient space for a written reply by the Architect.

4. All RFI's shall be numbered sequentially from beginning to completion of the Project.

O. Electronic Submittal:

1. RFI Submittals: RFI file name must be the RFI number – job number (ie: RFI#1 – 17-496) and must contain the following:

   Project name
   Date.
   Submittal purpose and description.
   Specification paragraph number or drawing designation.

2. Shop Drawing Submittals: Shop Drawing file name must be Section Number – Job Number (ie Section 05 12 00 – 17-496) and must contain the following:

   Project name
   Date
   Specification Section number and title.
   Contractor's stamp and review comments on the shop drawing itself.
   Indication of full or partial submittal.

P. Number of Copies Required for Submittals:

1. Number of copies of submittals shall be generally as described below, except where otherwise noted in these Specifications. However, <u>all final decisions</u> regarding this issue will be made at the Preconstruction Conference.

2. <u>Type of Submittal:</u>

   a. <u>Contractor's Construction Schedule:</u> Submit in duplicate.

   b. <u>Schedule of Submittals:</u> Submit in duplicate.

   c. <u>Daily Construction report:</u> Submit in duplicate.

   d. <u>Shop Drawings</u>: Submit 6 copies.

   e. <u>Product Data</u>: Submit 6 copies.

   f. <u>Samples</u>: Submit samples in duplicate until approval is secured, and then submit 2 additional equivalent samples for Architect's use.

g. Quality Assurance Submittals: as required by other Sections of the Specifications.

h . Schedule of Values: Submit in duplicate.

i. RFI: Duplicate or 1 PDF.

j. Electronic Submittal: 1 PDF.

Q. Other Submittals:

1. Comply with submittal requirements specified in this Section and in other Sections and parts of the Project Manual.

R. Unsolicited Submittals:

1. The Architect will return unsolicited submittals to the sender without action.

1.3 SUBMITTALS

A. General

1. Each submittal shall be complete with a "Submittal Data" sheet completely filled out with all requested information including the Contractor's stamp. A sample "Submittal Data" sheet is included at the end of this section.
2. All submittals shall be dated and shall contain the project name; description or names of equipment; materials or equipment which are to be installed, reference to the Section of Specifications where it is specified and Drawing number where shown.
3. The use of Contract Documents for submittal of shop drawings is prohibited.

1.6 MATERIAL SAFETY AND DATA SHEETS (MSDS)

A. Provide MSDS sheets as follows:

1. One set to keep on site at all times.
2. Send one set the OWNER as required by Article 18 of the Guilford County's General Terms and Conditions.
3. One set to be submitted for final close-out documents. See Section 0I 70 00-Project closeout for more information.
3. Do not forward MSDS to the Architect for Review or distribution.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.1 GENERAL:

A. Contractor shall provide one certification form for each item submitted. All certification forms not properly signed shall be returned stamped Rejected.

SEE LAST PAGE FOR CONTRACTOR'S CERTIFICATION FORM

CONTRACTOR'S CERTIFICATION FORM

NAME OF PROJECT:

PROJECT NUMBER:

OWNER:

ARCHITECT: Walter Robbs Callahan & Pierce Architects, PA

SPECIFICATION DIV. NO. _____

SPECIFICATION PARA. NO. _____

DRAWING REFERENCE: _____

OTHER: _____

CONTRACTOR'S CERTIFICATION

I certify that I have checked this submittal for accuracy, dimensional conformance, completeness and compliance with the requirements of the Contract Documents, and it has been coordinated with the work of this contract and the work of other contractors as applicable. No deviations are included unless specifically noted and listed in separate correspondence.

_____ _____

Contractor Date

END OF SECTION 01 33 00

SECTION 01 35 20 - GENERAL PROJECT PROCEDURES

PART 1-GENERAL

1.1 DESCRIPTION OF WORK:

A. Work Specified In This Section:
1. This Section specifies requirements for general project procedures.

1.2 BURNING ON SITE

A. Open fire, for any purpose, will not be pemitted within the building enclosure or on the project site.

1.3 CLEANLINESS DURING CONSTRUCTION

A. Maintain the site of the Project free of debris, scattered materials, and equipment.

B. Remove all construction equipment, scaffolding, barricades, tools, surplus materials, etc. no longer required at the site. Remove all debris from building and grounds, and in general do all sweeping, brushing, cleaning, polishing, dusting, etc, required to present project in completely finished state. Refer to various sections of specifications for specific cleanup requirements.

C. Provide refuse containers located so as to be easily accessible to all workers at the site. These containers shall be for the deposit of garbage, refuse from meals, and other trash which might attract verinin. Containers shall have properly fitting lids which shall be maintained normally closed. Containers shall be emptied regularly, and their contents removed from the site. No open accumulation of refuse will be permitted.

D. Provide walk-off mats for all personnel designed to pick-up dust and construction particles at all transfer points going between construction and non-construction areas.

1.4 CONSTRUCTION DOCUMENTS

A. Additional Drawings and/or Specifications may be obtained at a Cost of reproduction and handling for plans and specifications shall be paid by the Contractor.

1.5 SITE SECURITY

A. The employment by the Contractor of his own security forces, should he deem it necessary, shall be at the Contractor's option.

1.6 USE OF CONSTRUCTION CHEMICALS AND MISCELLANEOUS FUME PRODUCING MATERIALS

A. Contractor shall take precautions as necessary to prevent migration of noxious, irritating or hazardous fumes and gases. Provide fresh air ventilation as required to work safely in confined areas.

1.7 APPROPRIATE DRESS

A. While on Owner's property, construction personnel shall wear pants, shirts, shoes, and required safety equipment at all times. The Owner reserves the right to direct the Contractor to immediately eject any person violating this requirement from the property.

1.8 DELIVERIES:

A. All deliveries shall be addressed to the Contractor at the job site.

1.9 MUD AND DUST FROM MOVEMENT OF VEHICLES:

A. The Contractor shall not allow mud, earth-droppings and dust to accumulate for more than one day before removing such from paved areas. At no time shall any accumulation be allowed.

B. The measures to be used to prevent littering the pavement shall include, but are not limited to the following:

1. Maintain dust control.

2. Sweeping and washing paved areas as required.

3. Picking-up droppings as they occur.

1.10 FIREARMS AND ILLEGAL DRUGS:

A. At no time shall any firearms (with or without permit) or illegal drugs be allowed on the project site.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 35 20

SECTION 01 41 00
SPECIAL INSPECTIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SUMMARY

A. Special Inspections and Structural Testing shall be in accordance with Chapter 17 of the North Carolina State Building Code, 2012 Edition.

B. Special Inspections are a quality assurance program intended to ensure that the work is performed in accordance with the Contract Documents.

C. This Section is intended to inform the Contractor of the Owner's quality assurance program and the extent of the Contractor's responsibilities. This Section is also intended to notify the Special Inspector, Testing Laboratory, and other Agents of the Special Inspector of their requirements and responsibilities.

1.3 SCHEDULE OF INSPECTIONS AND TESTS

A. Required inspections and tests are described in the "Statement of Special Inspections" attached at the end of this Section.

1.4 QUALIFICATIONS

A. The Special Inspector shall be a licensed Professional Engineer or licensed Registered Architect who is approved by the Owner.

B. The Testing Laboratory and individual technicians shall be approved by the Owner.

C. The Testing Laboratory shall maintain a full-time licensed Professional Engineer on staff who shall certify the test reports. The Engineer shall be responsible for the training of the testing technicians and shall be responsible for the field and laboratory testing operations.

D. Special Inspections shall be performed by inspectors who are a licensed Professional Engineer, licensed Registered Architect, Engineer-in-Training or Engineering Intern with an education and background applicable to the work being inspected, except as indicated below:

1. Technicians performing standard tests described by specific ASTM Standards shall have training in the performance of such tests and must be able to demonstrate either by oral or written examination competence for the test to be conducted. They shall be under the supervision of a licensed Professional Engineer or licensed Registered Architect and shall not be permitted to independently evaluate test results.

2. Technicians performing construction field observations shall have training in the review and observation of specific construction materials and must be able to demonstrate either by oral or written examination competence for the test to be conducted. Technicians shall have certifications provided by accredited Professional Organizations within the industry for satisfactory completion of courses or tests demonstrating a thorough understanding of the work. They shall be under the supervision of a licensed Professional Engineer or licensed Registered Architect and shall not be permitted to independently evaluate test results.

1.5 SUBMITTALS

A. The Special Inspector and Testing Laboratory shall submit to the Architect and Owner, for review, a copy of their qualifications, which shall include the names and qualifications of each of the individual inspections and technicians who will be performing inspections or tests.

B. The Special Inspector and Testing Laboratory shall disclose any past or present business relationship or potential conflict of interest with the Contractor or any of the Subcontractors whose work will be inspected or tested.

1.6 PAYMENT

A. The Contractor shall engage and pay for the services of the Special Inspector, Agents of the Special Inspector and the Testing Laboratory.

B. If any materials which require Special Inspections are fabricated in a plant which is not located within 100 miles of the Project, the Contractor shall be responsible for the travel expenses of the Special Inspector or Testing Laboratory.

1. Expenses shall be adequate to provide same-day round-trip transportation to remote plant.

2. Expenses shall include travel, lodging and meals.

C. The Contractor shall be responsible for the cost of any retesting or reinspection of work which fails to comply with the requirements of the Contract Documents.

1.7 CONTRACTOR'S RESPONSIBILITES

A. The Contractor shall cooperate with the Special Inspector and his agents so that the special inspections and testing may be performed without hindrance.

B. The Contractor shall review the "Statement of Special Inspections" and shall be responsible for coordinating and scheduling inspections and tests. The Contractor shall notify the Special Inspector or Testing Laboratory at least 24 hours in advance of a required inspection of test. Un-inspected work that required inspection may be rejected solely on that basis.

C. The Contractor shall provide incidental labor and facilities to provide access to the work to be inspected or tested, to obtain and handle samples at the site or at the source of products to be tested and to facilitate tests and inspection, storage and curing of test samples. Energy costs related to the testing of the smoke removal system shall be responsibility of the Contractor.

D. The Contractor shall keep, at the Project site, the latest set of construction drawings, field sketches, approved and field use shop and erection drawings and specifications for use by the inspectors and testing technicians.

E. The special inspection program shall in no way relieve the Contractor of his obligation to perform the work in accordance with the requirements of the Contract Documents or form implementing an effective quality control program. All work that is to be subjected to Special Inspections shall first be reviewed by the Contractor's quality control personnel.

F. The Contractor shall be solely responsible for construction site safety.

1.8 LIMITS ON AUTHORITY

A. The Special Inspector or Testing Laboratory must not release, revoke, alter, or enlarge on the requirements of the Contract Documents.

B. The Special Inspector or Testing Laboratory will not have control over the Contractor's means and methods of construction.

C. The Special Inspector or Testing Laboratory shall not be responsible for construction site safety.

D. The Special Inspector or Testing Laboratory has no authority to stop the work.

1.9 RECORDS AND REPORTS

A. Detailed daily reports shall be prepared of each inspection and test and submitted to all interested parties. Reports shall include:

1. Date of test or inspection.
2. Name of inspector or technician.
3. Location of specific areas tested or inspected.
4. Description of test or inspection and results.
5. Applicable ASTM Standard.
6. Weather conditions.
7. Engineer's seal and signature.

B. The Special Inspector shall submit interim reports to the Owner at the monthly meetings, which includes all inspections and test reports received that week. Copies shall be sent to the Architect, Engineer and Contractor.

C. Any discrepancies from the Contract Documents found during a Special Inspection shall be immediately reported to the Contractor. If the discrepancies are not corrected, the Special Inspector shall notify the Owner. Reports shall document all discrepancies identified and the corrective action taken.

D. The Testing Laboratory shall immediately notify the Architect and Owner by telephone, fax, or email of any test results which fail to comply with the requirements of the Contract Documents.

E. Reports shall be submitted to the Special Inspector within seven (7) days of the inspection or test. Handwritten reports may be submitted if final typed copies not available.

F. At the completion of the work requiring special inspections, each inspection agency and testing agency shall provide a statement to the Special Inspector that all work was completed in substantial conformance with the Contract Documents and that all appropriate inspections and tests were performed.

1.10 FINAL REPORT OF SPECIAL INSPECTIONS

A. The "Final Report of Special Inspections" shall be completed by the Special Inspector and submitted to the Architect and Owner prior to the issuance of a Certificate of Use and Occupancy.

B. The "Final Report of Special Inspections" will certify that all required inspections have been performed and will itemize any discrepancies that were not corrected or resolved.

1.11 SCHEDULE OF SPECIAL INSPECTION SERVICES

A. General: See attached schedules.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 41 00

Statement of Special Inspections

Project:	Guilford County Law Enforcement Center
Location:	Greensboro, NC
Owner's Representative:	Guilford County
Owner's Address:	Old County Courthouse, 301 W. Market Street, Greensboro, North Carolina 27401
Architect of Record:	Walter Robbs Architects, Inc.
Structural Engineer of Record:	SKA Consulting Engineers, Inc.

This Statement of Special Inspections is submitted as a condition for permit issuance in accordance with the Special Inspection requirements of the 2012 North Carolina State Building Code. It includes a Schedule of Special Inspection Services applicable to this project as well as the name of the Special Inspector and the identity of other approved agencies intended to be retained for conducting these inspections.

The Special Inspector shall keep records of all inspections and shall furnish inspection reports to the State Construction Office, Structural Engineer and Architect of Record. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the State Construction Office, Structural Engineer and Architect of Record. The Special Inspections program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Local Building Official or other Authority Having Jurisdiction, Owner, Contractor, Structural Engineer and Architect of Record.

Interim Report Frequency: Monthly

A Final Report of Special Inspections documenting completion of all required Special Inspections and correction of any discrepancies should be submitted prior to issuance of a Certificate of Use and Occupancy.

Job Site safety and means and methods of construction are solely the responsibility of the Contractor.

Statement of Special Inspections Prepared by (Structural Engineer of Record):

Christopher Bathgate, P.E.

(Type or print name)

Signature Date

Owner's Authorization Accepted by:

Signature Date Signature Date

Schedule of Special Inspection Services

The following sheets comprise the required schedule of special inspections for the project. The construction divisions which require special inspections for this project are as follows.

☒ Cast-in-Place Concrete
☒ Sprayed Fire Resistant Material
☒ Retaining Walls over 5 FT
☒ Soils

Inspection Agents	Qualifications	Address
1. Special Inspector	SI	TBD
2. Structural Engineer of Record	SE	SKA Consulting Engineers, Inc. 300 Pomona Drive Greensboro, NC 27407
3. Testing Laboratory	ITL	TBD
4. Architect of Record	AOR	Walter Robbs Architects 530 North Trade Street, Winston-Salem, NC 27101
5. Engineer of Record Plumbing, Mechanical	EOR	Consultant Engineering Service 811 West Fifth St., Ste. 101 Winston-Salem, NC 27101
6. Engineer of Record Electrical	EOR	

Note: The inspection and testing agent shall be engaged by the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the State Construction Office, prior to commencing work.

Seismic Design Category: N/A – Existing Building
Note: A seismic quality assurance plan is <u>not</u> required for the existing building.

Basic Wind Speed: 90 mph

Wind Exposure Category: C
Note: A wind quality assurance plan is <u>not</u> required for this project due to the Exposure Category C rating and the 3-second Gust Basic wind speed of 90 mph, which is below the 110 mph threshold.

Schedule of Special Inspection Services

Cast-in-Place Concrete

Item	Qualifications	Scope
1. Mix Design/Material Certifications	SER / SI SER / SI	• Collect mix designs and verify appropriate mix use during specific installation • Collection of certified mill test reports for reinforcing steel
2. Reinforcement Installation	SER / SI SI	• Periodic inspection of reinforcing steel • <u>Continuous</u> inspection of reinforcing steel welding.

3. Concrete Placement/Monitoring Fresh Concrete, Sampling & prep of test samples	SI SI / ITL SI / ITL SI	• Continuous inspection of cast-in-place concrete placement. • Periodic verification of correct mix design used during placement. • Continuous monitoring of sampling of fresh concrete, slump test, air content test, temperature of concrete and creation of strength test specimens • Continuous inspection of bolts to be installed in concrete prior to and during placement
4. Curing & Protection	SI	• Periodic inspections of curing techniques
5. Precast Concrete Members	SER / SI	• Verify welds of the new and/or re-attached precast members conform to AWS specifications
8. Formwork	SER / SI	• Periodic verification of formwork for shape, location, and dimensions of concrete members being formed.
9. Adhesively Anchored Connectors and Reinforcing	SI / ITL	• Verify installing Personnel have been trained for adhesive installation • Verify Materials, spacing and location • Verify Installation Conditions • Verify installation depth and hole preparation. • Continuous Inspection of Adhesive and Anchor/Reinforcement installation • Verify/Observe Post-installed Torque • Continuous monitoring of proof load tests

Retaining Walls over 5ft
See Cast-in-place Concrete and Soils

Soils

Item	Qualifications	Scope
1. Verify Materials.	SI	• Periodic inspection to verify materials below shallow foundations are adequate to achieve the design bearing capacity. • Periodic inspection of classification and testing of compacted fill materials. • Continuous inspection to verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill. • Periodic inspection of subgrade to verify it has been prepared properly prior to placement of compacted fill.
2. Construction	SI	• Periodic inspection of excavations to verify proper depth and proper bearing material.

Sprayed On Fire Resistant Materials

Item	Qualification	Scope
1. Fireproofing of Steel	SI / ITL	• Inspect preparation of substrate prior to installation in accordance with approved fire resistance design and approved manufacturer's written instructions • Inspect that substrate has minimum ambient temperature before and after application as specified by the fire resistance design and approved manufacturer's written instructions • Test thickness of sprayed on material per fire resistance design and approved manufacturer's written instructions and Section 1704.12.4 of the North Carolina State Building Code for structural members, floor, roof and wall assemblies. • Test Density of sprayed on material per fire resistance design and approved manufacturer's written instructions and Section 1704.12.5 of the North Carolina State Building Code for structural members, floor, roof and wall assemblies. • Test bond Strength of in place samples to ensure a value greater than 150 ponds per square foot in accordance with ASTM E736 for structural members, floor, roof and wall assemblies.

SECTION 01 42 10 - REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 DEFINITIONS

A. General:
1. Definitions contained in this Section are in addition to those include in the Conditions of the Contract.

B. Indicated:
1. The term "indicated" refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.

C. Directed:
1. Terms such as "directed," "requested," "authorized," "selected," "approved," and “permitted” mean “directed by the Architect,” “requested by the Architect”, and similar phrases.

D. Approve:
1. The term "approve" and "approved," where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect’s duties and responsibilities as stated in the Conditions of the Contract.

E. Satisfactory:
1. The words "satisfactory", submitted", "reported", and similar words and phrases shall be presumed to be followed by "to the Architect."

F. Equal To:
1. "Equal To", "Or Architect Approved Equal", and "Or Approved Equal" shall mean products by manufacturers other than those described or listed in the Contract Documents which the Contractor has submitted for substitution prior to bid and have been approved for use by the Architect in Addenda issued prior to execution of the Contract.

G. Regulations:
1. The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

H. Furnish:
1. The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

I. Install:
1. The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, fabrication, placing, anchoring, connecting, applying, working to dimension, fmishing, curing, protecting, adjust and test except where otherwise specified, cleaning, and similar operations."

J. Provide:
1. The term "provide" means "to furnish and install, complete and ready for the intended use or operation."

K. Installer:
1. An "Installer" is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular constriction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

2. The term "experienced," when used with the term "Installer," means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the requirements indicated, and having complied with requirements of the authority having jurisdiction.

L. Trades:
1. Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades persons of the corresponding generic name.

M. Assignment Specialist:
1. Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.

2. This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

N. Project Site:
1. Project site is the location of the project.

O. Contract Limits:
1. Contract Limits is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Contract Limit is shown on the Drawings and may not be identical with the description of the Project Site.

P. Testing Agencies:
1. A "testing agency" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.2 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Content:
1. This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explaned as follows:
a. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as plural and plural words interperted as singular where applicable as the context of the Contract

Documents indicates.

b. Streamlined Language: The Specifications generally use the imperative mode and streamlined language. Requirements expressed in the imperative mode are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.

2. The words “shall be” are implied where a colon (:) is used within a sentence or phrase.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards:

1. Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates:

1. Comply with the standard in effect as of the date of the Contract Documents.

C. Conflicting Requirements:

1. Where compliance with two or more standards is specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels, the Contractor shall refer requirements that are different but apparently equal, and uncertainties to the Architect for a decision before proceeding.

2. Minimum Quanity or Quality Levels: The quantity or quality level shown or specified shall be the minimum acceptable. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum. To comply with these requirements, indicated numberic values are minimum or maxiumu, as appropriate, for the context of the requirements. Refer undertainties to the Architect for a decision before proceeding.

1.4 REFERENCE TO INDUSTRY STANDARDS

1. Whenever reference is made to codes, standard specifications, or other data published by regulating agencies or accepted organizations, it shall be understood that such reference is made to the latest edition (including addenda) published prior to the date of the Contract Documents, except as noted specifically otherwise by date in the Contract Documents.
2. Requirements included in referenced standards are included into the Contract Documents by reference thereto and are an integral part of the Contract Documents as much so as if included verbatim.
3. Among those frequently used in the Contract Documents are the following (with the respective abbreviations used):

American Society for Testing and Materials (ASTM)
U. S. Department of Commerce
Commercial Standards (CS)
Product Standards (PS)
Federal Specifications (FS)
American National Standards Institute (ANSI)
National Electric Code (NEC)
North Carolina State Building Code (Code)
Underwriter's Laboratories Inc. (UL)
Architectural Woodwork Institute (AWI)
American Architectural Manufacturer's Association (AAMA)
American Concrete Institute (ACI)

American Iron and Steel Institute (AISI)
American Welding Society (AWS)
Prestressed Concrete Institute (PCI)
Steel Joist Institute (SJI)
Steel Deck Institute (SDI)

1.5 LAYOUT WORK

1. Lines and Levels: Owner will establish lot lines, restrictions, and a bench mark. General Contractor shall establish bench marks in not less than 2 widely separated places. As work progresses, General Contractor shall establish bench marks at each floor level, giving exact levels of various floors. As work progresses, General Contractor shall lay out exact location of all partitions as a guide to all trades. All other grades, lines, levels, and bench marks shall be established and maintained by the Contract requiring them, and they shall be responsible for same.

2. Construction Tolerances:

    a. Variation from Plumb: For vertical lines and surfaces of columns, walls and arrises do not exceed 1/4" in 10', or 3/8" in a story height not to exceed 20', nor 1/2" in 40' or more. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story or 20' maximum, nor 1/2" in 40' or more.

    b. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other horizontal lines, do not exceed 1/4" in any bay of 20' maximum, nor 1/2" in 40' or more. For top surface of bearing walls do not exceed 1/8" between adjacent floor elements in 10' of 1/16" within width of a single unit.

    c. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls and partitions, do not exceed 1/2" in any bay of 20' maximum, nor 3/4" in 40' or more.

    d. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4" nor plus 1/2".

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 42 10

SECTION 01 45 00 - QUALITY CONTROL/QUALITY ASSURANCE

PART 1-GENERAL

1.1 DESCRIPTION OF WORK:

A. Work Specified In This Section:
1. This Section specifies administrative and procedural requirements for quality control/assurance services.
2. Quality assurance services, by the Contractor, include inspections and tests and related actions including reports, performed by Independent Testing Laboratories (ITL) to verify compliance with requirements specified or indicated.
3. Inspections, tests and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.
4. Specific quality control requirements for individual construction activities are specified in the Sections for those activities.
5. Requirements for the Contractor to provide quality control services required by the Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 QUALITY ASSURANCE:

A. Qualification for Service Agencies:
1. An Independent Testing Laboratory (IT'L) which specializes in the types of inspections and tests to be performed and which is acceptable to the Owner and the Architect will be engaged by the Contractor.

1.3 RESPONSIBILITIES:

A. Contractor Responsibilities:
1. Quality control is the sole responsibility of the Contractor, and shall cover the activities of the General Contractor, his subcontractors, and their suppliers as required to assure compliance with the Contract Documents that constitute the contract between the Contractor and the Owner. The Contractor shall submit a proposed quality control plan at the pre-construction meeting, indicating the volume of test and test frequencies. The Architect will review the submitted Contractor's quality control program prior to construction.

B. Coordination:
1. The Contractor shall cooperate with the ITL performing required tests and similar services and provide equipment, access, or other means required by the ITL to facilitate performnance of their services. Notify the ITL sufficiently in advance of operations to permit assignment of personnel.

C. Testing:
1. The Contractor will employ an independent testing laboratory for testing required by these Specifications. The Contractor shall notify the testing laboratory a minimum of 24 hours in advance of performing work requiring specified testing.
2. In the event that proper notice is not given to the testing laboratory prior to beginning work, the Contractor shall cease such work until the laboratory can properly man the Project.
3. All testing and balancing is to be performed by the Contractor.

4. All Special Inspections performed by the Contractor's testing laboratory. Contractor to coordinate with the Special Inspector.

D. Duties of the ITL:
1. The ITL engaged to perform sampling and testing of materials specified in the Specifications shall cooperate with the Architect and Contractor in performance of its duties, and shall provide qualified personnel to perform required tests.
2. The ITL shall immediately notify the Architect, Owner and Contractor of irregularities or deficiencies observed in the Work during performance of its services.
3. The ITL shall not perform any duties of the Contractor.

1.4 SUBMITTALS:

A. The ITL shall submit a certified written report of each test or similar service, to the Contractor. The Contractor shall, submit a certified written report of each inspection, test or similar service as noted below..

B. The ITL shall send copies of test and inspection reports to the following parties:
1. 2 copies to the Owner or his Representative.
2. 2 copies to the General Contractor.
3. 1 copy to the Architect.

C. The Contractor shall be responsible for notifying the Owner, Architect, Engineer, and ITL when the source of any material is changed after the original tests have been made.

D. If, in the opinion of the ITL, any of the work of the Contractor is not satisfactory, the Contractor shall make all tests that the Architect deems available to determine its proper construction in conformance with the Contract Documents.

E. Retesting is the responsibility of the Contractor when initial tests indicate work does not comply with the requirements of the Contra Documents.

PART 2 - PRODUCTS (Not Applicable).

PART 3 – EXECUTION (Not Applicable).

END OF SECTION 01 45 00

SECTION 01 50 00 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Work Specified In This Section:
1. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

1.2 QUALITY ASSURANCE

A. Regulations:
1. Comply with industry standards and applicable laws and regulations of authorities having jurisdiction.

B. Electrical Service:
1. Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70) and all regulatory state agencies.

1.3 PROJECT CONDITIONS

A. Conditions of Use:
1. Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures.

2. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

1.4 Temporary Street Closures:

A. Contractors shall be responsible for submitting to and obtaining from the proper authorities for all permits required for proposed and/or necessary temporary street or lane closures during the course of Construction, including site and building demolition, grading, drainage, erosion control and landscaping. Cost of all permits will be the Contractor's responsibility.
1. Potential partial street closures include: the east end of W. Sycamore Street along the north side of the Guilford County Law Enforcement Center; and portions of the west lane of S. Eugene Street along the east side of the Guilford County Law Enforcement Center.

2. Provide all fences, pedestrian enclosures, barricades, signage, lights and traffic control during street or lane closures as required by local authorities.

3. Remove all protective measures immediately upon completion of construction activities that necessitated closures.

4. Repair any damage caused by construction activities to street pavement, curb and gutter, sidewalks, drainage systems, lighting and public or private utilities to the satisfaction of the local authorities.

PART 2 - PRODUCTS

2.1 TEMPORARY UTILITIES:

A. Water Service: The Contractor shall make the necessary arrangements and provide all water service and distribution piping of sizes and pressures adequate for the entire construction period.

B. Electric Power Service: The Contractor shall make the necessary arrangements and provide all temporary electric service and lighting required by all trades during the entire construction period; in a safe operating condition and in compliance with applicable State requirements.Service shall be minimum 200 amp, 110-220 volt, and single phase, properly grounded in accordance with NEC requirements.The metered cost of electricity used shall be borne by the Contractor.

C. Telephone: Cell phone is an acceptable job site phone.

D. Temporary Toilet Facilities:

1. Contractor shall provide and maintain an adequate number of temporary toilets with proper enclosures as necessary for use of all trades during construction. Location of toilets shall be subject to approval of the Architect. Keep toilets clean and comply with all local and state health requirements and sanitary regulations.

2. Toilet facilities shall be the prefabricated chemical type. Remove temporary toilets at completion of the work.

2.2 WEATHER PROTECTION, TEMPORARY HEAT, VENTILATION AND AIR CONDITIONING

A. Methods: The methods of temporary heating or cooling and the type of fuel and equipment used shall be subject to approval by the Designer.

B. Extent: The Contractor shall provide all weather protection, temporary heat or cooling and fuel as necessary to carry on the work expeditiously during inclement weather, to protect all work and materials against injury from dampness and cold, to dry out the building and to provide suitable working conditions for the installation and curing of materials until the installation of interior finishes begins.

C. When installation of the interior finishes begin the permanent HVAC system will be used for climate control. Permanent HVAC system must be used for a sufficient amount of time to bring the space within the required temperature and humidity parameters prior to the start of the finish work and shall maintain adequate climate control for the duration of the finish work. Refer to individual specification Sections for required temperature and humidity ranges.

1. The use of temporary temperature and humidity controls other than the use of the building's permanent HVAC system when interior finishes begin will be permitted only when **approval by the Designer and Owner is obtained PRIOR to** installation of any finish.

2. Interior finish is defined as an interior product or system that has specified ENVIRONMENTAL CONDITIONS and/ or recommended manufacturer's temperature and humidity requirements.

2.3 USE OF PERMANENT EQUIPMENT

A. HVAC subcontractor shall have the permanent buildings systems in sufficient readiness for furnishing climatic control at the time the building is enclosed and secured. The HVAC systems shall maintain climatic control throughout the enclosed portion of the building sufficient to allow installation of the interior finishes of the building. A building shall be considered enclosed and secured when windows, doorways (exterior, mechanical, and electrical equipment rooms), and hardware are installed; and other openings have protection which will provide reasonable climatic

control. The appropriate time to start the mechanical systems and climatic condition shall be jointly determined by the Contractor, HVAC subcontractor and the Designer. Use of the equipment in this manner shall in no way affect the warranty requirements of the HVAC equipment.

B. After building is completely enclosed, the Contractor will utilize the permanent mechanical equipment with the qualifications herein stipulated; he shall, however, supply any additional equipment required. Any permanent equipment so used shall be turned over to the Owner in the condition and at the time required by the Specifications. The Contractor's use of the permanent equipment is hereby qualified as follows:

1. Permanent Equipment: The permanent equipment shall not be used for temporary heat or cooling unless and until all safety devices specified or required for safe operation of the equipment are installed and operating properly.

2. Cost: The Contractor shall pay all power and fuel costs required by the use of the permanent heating and cooling equipment. The HVAC subcontractor shall be responsible for the readiness and maintenance of the equipment during the period that it is used after the building is enclosed.

C. The HVAC subcontractor will supply the initial filters required for the equipment and one (1) set during the use of the permanent equipment. The Contractor shall provide all additional filters required. The Contractor will provide filters at all points where air enters the system. Maintain such filters until the building is occupied.

D. The HVAC subcontractor will still be required to provide the guarantees specified in Division 23 - Mechanical or shown on Mechanical Drawings, for the length of time specified and with the time beginning at final acceptance of the facility.

2.4 SUPPORT FACILITIES

A. Contractor's Temporary Field Office: Contractor shall provide and maintain a suitable temporary field office at the Project Site for his own use and available to the Owner and Architect during normal working hours.

1. Office shall be painted, heated during cold weather, and provided with movable windows, doors, locks, and adequate lighting to facilitate reading of the documents and other paperwork and other functions normally required in a field office. Provide layout tables, chairs, drawing racks and other furniture and equipment normally required for this purpose.

2. Location of temporary office shall be subject to approval by the Architect.

B. Temporary Sheds: Contractor shall provide and maintain additional storage sheds and other temporary buildings or trailers as required for proper storage of materials on the site. Location of sheds and trailers shall be subject to the approval of the Architect. Remove sheds when work is completed.

C. Project Sign: Contractor shall furnish, erect and maintain a Project sign fabricated from preservative treated lumber and exterior grade, 3/4" thick fir plywood, and as detailed on the Drawings.

1. Sign shall be mounted securely and rigidly on pressure-treated posts and shall be located where directed by the Architect.

2. No other signs will be allowed unless specifically approved by the Oner or required by law.

3. Project signs on this project will be as approved by the Owner and as approved by local zoning jurisdinction.

4. The Contractor shall provide temporary directional signage around construction areas which block normal pedestrian or vehicular traffic.

D. Temporary Construction Fence: Contractor is to provide a temporary galvanized chain link fence, minimum of 6'-0" height, with all required gates, locks and other components as necessary to isolate the construction area from the Owner's personnel and the general public and to provide security for construction materials and equipment.

1. Materials and methods of fence construction shall be adequate to provide for the safety and security of the project site and shall be the Contractor's responsibility to select; however as a minimum standard, fence shall be chain link type, minimum six feet high, consisting of 9 gauge galvanized wire fabric supported on galvanized posts set firmly in the ground at 10 feet o.c. horizontally, maximum.

2. Provide gates as required.

3. No barbed wire will be permitted.

4. Remove and relocate fence when it interferes with the work of any trade or Interfere with the use of the new addition when occupied.

5. Keep gates closed at all times and locked during non-working hours.

E. Barricades, Warning Signs and Lights:

1. Comply with standards and code requirements for erection of structurally adequate barricades. Provide warning signs to inform personnel and the public of the hazard being protected.against. Where appropriate and needed provide lighting, including flashing red or amber lights.

2.5 PROTECTION: Protection shall consist (in general) of the following:

A. Plant Material: Contractor shall protect all trees, shrubs, lawns, and all landscape work from damage, providing guards and covering. Any damaged work shall be repaired or replaced at Contractor's expense.

B. Streets and Walks: Contractor shall protect all existing streets and walks, and shall repair any damaged during construction at his own expense.

C. Private Roads and Walks: Contractor shall protect existing private roads and walks. He shall maintain them during course of work and shall repair all damages to same at his own expense.

D. Safety: The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work.

E. Heating Occupied Spaces Prior to Final Acceptance: Should a portion of the building be occupied by the Owner prior to substantial completion, the cost of fuel and operation of the heating system for the occupied portion will be borne by the Owner from time of occupancy until final acceptance.

F. Water Protection: Contractor shall, at all times, protect excavation and trenches from rain water, spring water, ground water, backing-up of drains or sewers, and all other water. He shall provide all pumps and equipment and enclosures to provide this protection.

G. Temporary Drainage: Contractor shall construct and maintain all necessary temporary drainage and shall do all pumping necessary to keep excavation and low areas free of water.

H. Snow and Ice: Contractor shall remove all snow and ice as may be required for proper protection and execution of work.

I. Guard Lights: Contractor shall provide and maintain guard lights at all barricades, obstructions in streets, roads, or sidewalks, and at all trenches or pits adjacent to public walks or roads.

J. Cold Weather: During cold weather, Contractor shall protect all work against damage. If low temperatures make it impossible to continue operations safely (in spite of cold weather precautions), Contractor shall cease work and shall so notify the Architect. In this event, the Contractor is still responsible for protecting all work in place.

K. Fire: Open fires will not be permitted.

L. Temporary Parking:

1. A location for parking of construction personnel vehicles or the Contractor's company vehicles shall be determined at the pre-construction meeting.

M. Temporary Storage:

1. Only the areas as directed by the Owner may be used for storing materials including stockpiling topsoil.

2. At the Owner's option, any stored materials including stockpiled soil in violation of this requirement will be removed at the Contractor's expense.

2.6 SITE MAINTENANCE:

A. At the completion of the building pad, the General Contractor will be responsible for maintaining an area fifty (50) feet wide from the outside face of any building. This area is to be maintained so as to provide access to the building by all trades. Maintenance will include, but is not limited to, keeping the area graded level, free of rutting and excessive mud accumulation. The General Contractor is responsible for maintaining this area until time for touch up grading. At this time. The General Contractor will re-grade the fifty (50) foot perimeter area and all areas disturbed by construction activities. Contractor will re-spread the topsoil around the building and provide permanent grassing and landscaping.

PART 3 – EXECUTION

3.1 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

A. Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion.

END OF SECTION 01 50 00

SECTION 01 63 00
PRODUCT SUBSTITUTIONS

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section specifies requirements for handling requests for substitutions made after award of the Contract.

B. The Contractor's Construction Schedule and Schedule of Submittals are included under Section 01 33 00 - Submittals.

C. Standards: Refer to Section 01 42 00 - Reference Standards for applicability of industry standards to products specified.

1.3 DEFINITIONS:

A. Definitions used in this Section are not intended to change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions". The following are not considered substitutions:

1. Substitutions requested by Bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.

2. Revisions to Contract Documents requested by the Owner or Architect.

3. Specified options of products and construction methods included in Contract Documents.

4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS:

A. Substitution Request Submittal: The Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received more than 60 days after commencement of the Work may be considered or rejected at the discretion of the Architect.

1. Submit 3 copies of each request for substitution for consideration.

(a) A reproduction of "Substitution Request Form", included as the last page of this Section, must be used and completely filled in for each request for substitution.

2. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:

(a) Product data, including drawings and descriptions of products, fabrication and installation procedures.

(b) Samples, where applicable or requested.

(c) A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.

(d) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors, that will become necessary to accommodate the proposed substitution.

(e) A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.

(f) Cost information, including a proposal of the net change, if any, in the Contract sum.

(g) Certification by the Contractor that the proposed substitution is equal to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application intended. Include the Contractor's waiver of rights to additional payment or time, that may subsequently become necessary because of the failure of the substitution to perform adequately.

B. Architect's Action: Within one week of receipt of the request for substitution, if necessary, the Architect will request additional information or documentation necessary for evaluation of the request. Within 2 weeks of receipt of the request, or one week of receipt of additional information or documentation, whichever is later, the Architect will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name. Acceptance will be in the form of a Change Order. Do not use any substitute materials or equipment without written approval of the Architect.

1.5 SUBSTITUTIONS:

A. Conditions: The Contractor's substitution request will be received and considered by the Architect when one or more of the following conditions are satisfied, as determined by the Architect; otherwise requests will be returned without action except to record noncompliance with these requirements.

1. Extensive revisions to Contract Documents are not required.

2. Proposed changes are in keeping with the general intent of the Contract Documents.

3. The request is timely, fully documented and properly submitted.

4. The request is directly related to an "or equal" clause or similar language in the Contract Documents.

5. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.

6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.

7. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.

8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.

9. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution can provide the required warranty.

10. Where a proposed substitution involves more than one prime Contractor, each Contractor shall cooperate with the other Contractors involved to coordinate the Work, provide uniformity and consistency, and to assure compatibility of products.

B. The Contractor's submittal and Architect's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

C. Substitute products shall not be ordered or installed without written approval of the Architect.

1.6 APPROVED SUBSTITUTIONS:

A. For approved substitutions, submit shop drawings, product data and samples in accordance with Section 01 33 00 - Submittals.

1.7 SUBSTITUTION REQUEST FORM: (See next page)

END OF SECTION 01 63 00

SUBSTITUTION REQUEST FORM:

TO: Matt Messick COPY TO:
Walter Robbs Callahan & Pierce *Architects*, PA
530 N. Trade Street, Ste 301
Winston-Salem, NC 27101

PROJECT: WRCP PROJECT NO.
SPECIFIED ITEM:

Section _____ Paragraph _____ Description _____

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION:_____

Upon submitting this Request for Substitution, the undersigned certifies that the following paragraphs are correct, unless otherwise modified on attachments:

1. Contractor has investigated the proposed substitution and believes that it is equal to or superior in all respects to the specified item and will conform to design requirements and aesthetic effect.
2. Cost saving or additional cost to Owner for accepting substitution: $_____ savings or $_____ add.
3. Contractor will pay the Architect and/or Engineers for additional studies, investigations, submittal reviews, redesign and/or analysis caused by the requested substitution, and at no additional cost to Owner.
4. Substitution requires dimensional changes or redesign of structure or PME Work: No _____ Yes _____ (If yes, attach complete data).
5. Contractor will waive future claims for added cost to Contract caused by substitution.
6. Changes in Contract Time caused by substitution: No _____ Yes _____ Add/Deduct _____ days.
7. Adverse effect on other Trades caused by substitution: None _____ Yes _____ (If yes, explain on attachment).
8. Contractor will modify other parts of the Work as may be required to make all parts of Work complete and functioning properly. Yes _____ (Explain on attached page if necessary).
9. Same type of warranty for specified product will be furnished of proposed substitution: Yes _____ No _____.
10. Maintenance service available? Yes _____ No _____ Where? _____
11. Contractor has complied with requirements of Section 01630 - Substitutions and the Contract Documents as part of request for substitution and has completely filled in this form. Yes _____ No _____.

REASON FOR NOT GIVING PRIORITY TO SPECIFIED ITEM: See attached _____ Not required _____.

Submitted by:

Signature_____
Contractor _____
Address _____
_____
Date _____
Telephone _____

Architect's Response:

_____ Approved
_____ Approved as Noted
_____ Rejected
Signature: _____
Firm: _____
Date: _____

REQUIRED ATTACHMENTS:

1. Product Data for Specified Item: Clearly marked to indicate full compliance with Specification Section and Contract Documents: Attached _____.
2. Product Data for Substitution: Clearly marked for adequate evaluation and comparison with data submitted for specified item: Attached _____.
3. Samples: Attached _____ Not Required _____.
4. Cost Data and Implications of Substitution: Attached _____ Not required _____.
5. Contractor's Comments: Attached _____ Not required _____.
6. Other: _____

END OF FORM

SECTION 01 74 00 - FINAL CLEANING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work Included This Section:

1. This Section specifies administrative and procedural requirements for final cleaning at Substantial Completion.

B. Special cleaning requirements for specific elements of the Work are included in appropriate Sections of Division 2.

C. Environmental Requirements:

1. Conduct cleaning and waste disposal operations in compliance with all laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.

2. Burning or burying of debris, rubbish or other waste material on the premises shall not be permitted.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 REMOVAL OF DEBRIS:

A. All debris and waste materials shall become the property of the Contractor and Contractor shall be responsible for removal of the debris from the Project Site on a periodic basis no less frequently than weekly. Contractor shall be responsible for clean up of his own waste materials and debris.

3.2 MUD AND DUST FROM MOVEMENT OF VEHICLES:

A. Contractor shall not allow mud, earth-droppings, and dust to accumulate for more than one day before removing such from public streets. At no time shall any accumulation be allowed which will create a hazard to safety or which will create bad public relations.

B. The measures to be used to prevent littering the pavement shall meet DEHNR requirements and shall include (but does not constitute the only measure to be used, if necessary) the following:

1. Maintain dust control.

2. Wash and/or sweep paved areas.

3. Pick up droppings as they occur.

C. Failure to clean streets promptly (within one day's notice) will result in the Owner having streets cleaned and deducting costs for same from Contractors' Contract Price.

3.3 FINAL CLEAN-UP:

A. Before final inspection and acceptance of the Project, Contractor shall clean work under the Contract, exterior and interior, to such an extent that the Owner can occupy and use the building for its intended purpose with no cleaning required by the Owner

B. General:

1. Employ experienced workers or cleaners for final cleaning. Clean each surface or unit of work to the condition expected from a professional building cleaning and maintenance program. Comply with manufacturer's instructions.

2. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion for the entire Project or a portion of the Project:

   a. Clean the Project site, yard and grounds, in areas disturbed by demolition activities of rubbish, waste materials, litter and foreign substances. Sweep paved areas broom clean. Remove petro-chemical spills, stains and other foreign deposits. Rake grounds that are neither planted nor paved, to a smooth even-textured surface.

   b. Remove tools, construction equipment, machinery and surplus material from the site.

END OF SECTION 01 74 00

SECTION 01 75 00
DOCUMENTS AT PROJECT SITE

1.1 DOCUMENTS AT THE PROJECT SITE:

A. The Contractor shall maintain at the Project Site one complete set of Drawings and Specifications, including all Addenda, Change Orders, and other official changes thereto, for his work. The Drawings and Specifications shall be maintained in good order and readable condition. The Drawings and Specifications shall be marked in red to show changes in the work required by Addenda, Change Orders, or other change directives, and shall show as-built changes. Changes shall be so noted immediately upon notification or completion of the changed work.

B. The Contractor shall also maintain at the Project Site approved submittals; shop drawings, and erection drawings. These documents shall be maintained in good order and readable condition.

C. All of the documents required at the Project Site under this Section shall be available for use by the Owner, or their representative, at all times.

D. Upon completion of the Project, the documents required under this Section shall be turned over to the Architect for the Owner.

END OF SECTION 01 75 00

SECTION 01 78 10 - PROJECT CLOSEOUT

PART 1-GENERAL

1.1 SUMMARY:

A. This Section includes administrative and procedural requirements for Project close-out for each Prime Contractor including, but not limited to, the following:

Inspection procedures
Project record documents
Operation and maintenance manuals
Guarantees and warranties
Affidavits
Quantity allowances and contingency allowances

1.2 SUBSTANTIAL COMPLETION

A. General:
1. The Work or designated portion thereof will not be considered suitable for Substantial Completion until all systems are operational as designed; all designated or required governmental inspections or certifications have been made and posted.

2. As a further condition of Substantial Completion, the Contractor(s) shall certify that all remaining work will be completed within 30 consecutive calendar days following the Date of Substantial Completion.

3 . Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor and recommendation by the Architect, the Owner shall make payment, reflecting adjustment in retainage, if any, for such Work or portion thereof as provided in the Contract Documents.

B. Forms:
1. All forms to be used shall be as indicated in the project manual.

1.3 FINAL ACCEPTANCE

A. At the completion of the Project prior to receiving final payment, the Contractor shall furnish the Owner, through the Architect, properly signed and notarized waivers of lien from all subcontractors employed and material suppliers furnishing materials for the Project. Such waivers shall be submitted before final payment will be certified by the Architect to the Owner.

1.4 INSPECTION PROCEDURES FOR SUBSTANTIAL COMPLETION AND FINAL COMPLETION:

A. Follow procedures as specified in the General Conditions and the Supplementary General Conditions.

1.5 RECORD DOCUMENTS:

A. Record Contract Drawings: Maintain and submit to Architect a clean, undamaged set of record Contract Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings

1. The Contractor(s) shall record on the Record Drawings maintained at the site all changes and selections made during construction and shall locate by dimensions showing actual field measurements of all major items which will be concealed in the completed Work.

2. Record drawings shall be provided in the form of reproducible drawing sheets (reproducible vellum) and reflect locations of concealed items that remain after Work is complete.

B. Record Shop Drawings: Maintain and submit to Architect a clean, undamaged set of record Shop Drawings. Mark the Shop Drawings to show the actual installation where the installation varies substantially from the Work as originally shown. Record a cross-reference at the corresponding location on the Contract Drawings.

C. Record Specifications: Maintain and submit to Architect one complete copy of the Project Manual, including addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction. Mark these Documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and Modifications.

D. Record Product Data: Maintain and submit to Architect one copy of each Product Data submittal. Note related Change Orders or any other modifications issued during construction. Mark these Documents to show significant variations in actual Work performed in comparison with information submitted.

E. Record Submittals: Maintain and submit to Architect one copy of all approved submittals.
1. Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the work. Immediately prior to the date or dates of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Architect for the owner's records.

1.6 OPERATION AND MAINTENANCE MANUALS:

A. Contractor shall submit to Architect before final acceptance of the Project, 2 copies (except where required specifically otherwise elsewhere in the Contract Documents) of all installation, operating, and maintenance instructions on equipment and materials furnished under his Contract. Each set of copies shall be bound in a 3-ring loose-leaf binder for 8 1/2" x 11" paper, with black vinyl covers. Label binder designating name of Project, name of Owner, which item, and name of Contractor.

B. The following is a list of Operation and Maintenance Manuals required to be delivered to the Architect for the Owner prior to final payment. The Contractor will be required to provide all operation and maintenance manuals specified in Divisions 1 through 33 of these Specifications, even if inadvertently left off of this list.

Operation and Maintenance Manuals:

1. HVAC equipment
2. Electrical equipment
3. Plumbing equipment

1.7 GUARANTEES AND WARRANTIES:

A. Contractor shall submit to Architect for the Owner before final acceptance 2 copies of all warranties, guarantees, and surety bonds on the work, as required under his Contract. All such documents shall show name of Project, location, and name of Owner.

B. Specific guarantees and warranties (in addition to the general 12-month warranty on the entire Project) include, but are not limited to, those listed below. The Contractor will be required to provide all guarantees and warranties specified in Divisions 1 through 33 of these Specifications, even if inadvertently left off of this list. All warranties and guarantees will begin at the time of Substantial Completion.

Guarantees and Warranties:

1. Insulating glass.
2. Roofing.
3. Sealant.
4. Wood doors.
5. Aluminum storefront.
6. See Sections of Divisions 22 thru 28 for guarantee requirements for mechanical and electrical work.

C. Equipment identification: Submit, in duplicate, diagram/ ledger/ code for identifying the following:

1. HVAC major components.
2. Electrical switchgear.
3. Electrical panels and circuits.

1.8 AFFIDAVITS:

A. Submit to the Architect the following affidavits, in duplicate, properly executed:

1.	AIA G 706	Contractor's Affidavit of Payment of Debts and Claims.
2.	AIA G 706A	Contractor's Affidavit of Release of Liens.
3.	AIA G 707	Consent of Surety to Final Payment

1.9 QUANTITY ALLOWANCES AND CONTINGENCY ALLOWANCES:

A. See Section 01 21 00 for quantity allowances and contingency allowances included in the Contract.

B. Compare actual quantities and amounts versus the specified allowances and verify that the proper adjustments have been made by execution of change orders.

1.10 ASBESTOS AND POLYCHLORINATED BIPHENYLS (PCB) FREE CERTIFICATION:

A. After completion of installation, but prior to Substantial Completion of Project, all Prime Contractors must submit asbestos and polychlorinated biphenyls free certification for all materials and equipment as specified in Division 2 through 33.

B. Certification shall be made only by the Owner, a Partner or a Corporate Officer, or other person duly authorized to sign binding agreements for the Contractor.

C. The certification shall be accompanied by a notarized letter of authorization from the Contractor naming the person duly authorized to sign for the Contractor.

D. The certification shall be on Contractor's letterhead and include the following information:

The undersigned hereby certifies that all products and materials installed, and processes used, do not contain any asbestos or polychlorinated biphenyls (PCB).

(Contractor's Name) _____

Signed: _____

(Printed Name) _____

Position: _____

Date: _____

1.11 OTHER SUBMITTALS: Comply with submittal requirements specified in other Sections and parts of the Project Manual.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable

END OF SECTION 01 78 10

SECTION 01 78 80 - WARRANTIES AND BONDS

PART 1- GENERAL

1.1 DESCRIPTION OF WORK

A. Work Included This Section:
1. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents.
2. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Sections of Divisions 2.
3. Certifications and other commitments and agreements for continuing services to Owner are specified in the Contract Documents.

B. Disclaimers and Limitations:
1. At no time shall any warranties/guaranties be submitted to the Owner for this project which supercedes or voids any of the Owners rights as established by the state's General Statutes for which the project is located.
2. Failure of the Contractor and/or its suppliers, and its subcontractors to enter into such warranties as required by the Contract Documents shall be considered a breach of contract.

1.2 WARRANTY REQUIREMENTS

A. Related Damages and Losses:
1. When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work. Do not reuse damaged materials.

1.3 SUBMITTALS

A. Written Warranties:
1. Submit written warranties to the Architect prior to Substantial Completion. The Architect’s Certificate of Substantial Completion designates a commencement date for warranties.

B. Form of Submittal:
1. At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, or supplier. Organize the warranty documents into an orderly sequence based on the Table of Contents of the Project Manual. Deliver all warranties to the Architect before or with the Request for Substantial Completion.

C. Reinstatement of Warranty:
1. When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement.
2. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

D. Replacement Cost:
   1. Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents.
   2. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of Work through a portion of its anticipated useful service life.

E. Owner's Recourse:
   1. Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

F. Rejection of Warranties:
   1. The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

PART 2 - PRODUCTS (not applicable)

PART 3 – EXECUTION (not applicable)

END OF SECTION 01 78 80

SECTION 01 83 00
EQUIPMENT MAINTENANCE AND OPERATIONS PROGRAM

1.1 SCOPE:

A. The Contractor shall set dates, approved by the Architect and Owner, for all major building systems start-up to be observed by the Owner's maintenance and operating personnel.

B. The various subcontractors involved in the following areas shall prepare start-up, shut-down and operating procedures for the following:

1. HVAC equipment
2. Electrical equipment
3. Plumbing equipment

C. Programs of instruction for the Owner's maintenance and operating personnel shall be prepared for the systems listed above, to be approved by the Architect and Owner, in order to explain the proper maintenance and operation of the building systems.

1.2 SCHEDULING:

A. The Owner's project representative will be responsible for the coordination of the maintenance and operating personnel. He shall advise the Architect of any problems which may occur in the operating procedures.

B. The Owner's maintenance and operating personnel will only enter the job site at the request of the Owner's project representative and with the approval of the Architect and Contractor. All comments from the maintenance and operating personnel shall be forwarded to the Contractor through the Architect.

C. This program shall be implemented prior to Final Inspection of the Project.

END OF SECTION 01 83 00

SECTION 02 22 00
SITE DEMOLITION

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Site Clearing and Stripping (Section 31 10 00).
2. Earthwork (Section 31 20 00).
3. Erosion and Sedimentation control (Section 31 25 00).

B. Work Included This Section:

1. The extent of demolition work is generally shown on the Drawings.

2. Removal and capping of existing utility lines, concrete footings, slabs, foundations and other existing structures necessary in order to properly install the new construction.

3. Removal of all demolition debris from the site and legal disposal thereof.

1.3 QUALIFICATIONS:

A. Regulatory Agencies:

1. The removal, relocation, modification, installation, and capping of all utilities shall be performed by the Contractor in accordance with requirements of the utility company or municipal authority having jurisdiction of that respective utility.

2. All work shall comply with the requirements of all applicable local and state regulatory agencies, ordinances and the North Carolina State Building Code.

1.4 PROTECTION:

A. Protect all utilities that are to remain active. Repair damage to all such utilities due to work under this Contract, to the satisfaction of the authority having jurisdiction over the utility. Active utilities shall be removed or relocated only as indicated, specified or directed. Inactive utilities shall be plugged, removed as indicated, or capped.

B. Ensure the safe passage of persons around the area of demolition. Conduct operations to prevent injury to adjacent building structures, property, facilities, and persons.

C. Provide all necessary signage, barriers, fences, guard rails, shoring and other measures necessary to ensure the protection of property, mechanical and electrical equipment, and the safety of people in the area.

D. Promptly repair damages caused to adjacent facilities by demolition operations at no cost to the Owner.

1.5 UTILITY SERVICES:

A. Maintain existing utilities, keep in service and protect against damage during demolition operations.

B. Promptly repair damages caused to existing utilities by demolition operations at no cost to Owner.

PART 2: PRODUCTS (not applicable)

PART 3: EXECUTION

3.1 INSPECTION

A. Prior to beginning any demolition, install all necessary protection and erosion control systems for the site. See Section 31 25 00 regarding erosion control requirements.

B. Verify and arrange with the Owner for the termination of utility services and the required modification and/or capping of all utility lines.

C. Obtain all required permits for the completion of the work.

3.2 DEMOLITION:

A. Conform to all city, state and federal pollution and safety regulations regarding demolition and disposal of debris.

B. Remove existing pavement, walls, footings, slabs, foundations, other structures and utility lines indicated on the Drawings to be removed or required to be removed in order for the proposed construction to proceed in a proper manner and in accordance with the Contract Documents.

C. Remove all debris from site and dispose of legally.

D. Existing structures that are located within the area of construction shall be completely removed including all footings, slabs, foundations, and other below grade components.

E. All cavities and depressions below existing adjacent grades resulting after demolition work shall be filled in with suitable fill and compacted as specified in Section 31.

3.3 SALVAGE MATERIALS:

A. Confirm with Owner which salvaged materials should be kept prior to demolition. All salvaged materials identified by the Owner shall be removed by the Owner.

B. All materials demolished, other than those identified by the Owner and/or specifically indicated otherwise, become the property of the Contractor who shall be responsible for their removal from the site and legal disposal thereof.

3.4 EROSION AND SEDIMENTATION CONTROL:

A. Comply with Federal, State and local requirements for erosion and sedimentation control. Submit required data and schedules to the appropriate governing authorities and receive written approval from each such authority prior to beginning demolition operations at the site.

B. Erosion and sedimentary control features indicated on the Drawings are recommendations only. The Contractor is fully responsible for compliance with governing requirements and providing all erosion control measures required during the work.

END OF SECTION 02 22 00

SECTION 02 22 10
SELECTIVE DEMOLITION

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification sections, apply to work of this Section.

1.2 DESCRIPTION OF WORK:

A. Extent of selective demolition work is indicated on the Drawings.

B. Types of Selective Demolition Work: Demolition requires the selective removal and subsequent offsite disposal of the following:

1. Portions of building structure indicated on the Drawings and as required to accommodate new construction.

2. Removal of interior partitions and other construction as indicated on the Drawings.

3. Removal of paving, fencing and other items shown on the site plan of the Drawings.

4. Removal of other items shown on the Drawings.

6. Removal of materials and items as required in order to properly install the new construction.

C. Removal Work Specified Elsewhere:

1. Cutting non-structural floors and walls for piping, ducts, and conduit is included with the work of the respective mechanical and electrical Divisions 23 and 26 specification sections.

2. Cutting holes in roof deck and complete installation of new rooftop equipment is specified in Division 23 sections and Structural drawings.

D. Related Work Specified Elsewhere:

1. Remodeling construction work and patching is included within the respective sections of specifications, including removal of materials for re-use and incorporated into remodeling or new construction.

2. Relocation of pipes, conduits, ducts, and other mechanical and electrical work are specified by respective trades.

1.3 SUBMITTALS:

A. Progress Schedule: The Contractor's Progress Schedule specified in Article 13 of the General Conditions and further in the Supplementary General Conditions is to show clearly the phases and sequence of work, including dates for the beginning and ending of each phase and sequence of work. As specified in the Supplementary General Conditions, the progress schedule is to be updated monthly and submitted with each pay request. The phasing and sequence of demolition work is to be included and shown on the Progress Schedule. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control protection.

B. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.

1.4 JOB CONDITIONS:

A. Occupancy: Owner will not be occupying the building during demolition.

B. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished.

1. Conditions existing at time of commencement of contract will be maintained by Owner insofar as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.

C. Partial Demolition and Removal: Items indicated to be removed but of salvable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

1. Storage or sale of removed items on site will not be permitted.

D. Protections: Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.

1. Provide protective measures as required to provide free and safe passage of general public around portions of building.

2. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or work to remain.

3. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

4. Protect floors with suitable coverings when necessary.

5. Construct temporary solid dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks if required.

6. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces, and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.

7. Remove protections at completion of work.

E. Damages: Promptly repair damages caused to adjacent materials or facilities by demolition work at no cost to Owner.

F. Traffic: Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

1. Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

G. Explosives: Use of explosives will not be permitted.

H. Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.

1. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

I. Environmental Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

PART 2: (Not Applicable)

PART 3: EXECUTION

3.1 INSPECTION:

A. Prior to commencement of selective demolition work, inspect areas in which work will be performed. Photograph existing conditions to structure, surfaces, equipment or to surrounding properties which could be misconstrued as damage resulting from selective demolition work; file with Architect prior to starting work.

3.2 PREPARATION:

A. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

1. Cease operations and notify the Architect immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.

B. Cover and protect equipment and fixtures to remain from soiling or damage when demolition work is performed in rooms or areas from which such items have not been removed.

C. Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes to portions of the building.

1. Construct dust-proof partitions of minimum 2 x 4 wood studs, and plywood on demolition side.

2. Provide weatherproof closures for exterior openings resulting from demolition work.

D. Locate, identify, stub off and disconnect utility services that are not indicated to remain.

1. Provide by-pass connections as necessary to maintain continuity of service to the building. Provide minimum of 72 hours advance notice to Owner if shut-down of service is necessary during change-over.

3.3 DEMOLITION:

A. Perform selective demolition work in a systematic manner. Use such methods as required to complete work specified herein and indicated on Drawings in accordance with demolition schedule and governing regulations.

1. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.

2. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors or framing.

3. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.

B. If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Architect in written, accurate detail. Pending receipt of directive from Architect rearrange selective demolition schedule as necessary to continue overall job progress without delay.

3.4 SALVAGE MATERIALS:

A. The Owner will remove materials and equipment that he desires to retain prior to beginning of construction relative to each phase of construction.

B. During construction, all materials and equipment required to be demolished and removed shall become the property of the Contractor and he shall dispose of these off sites.

3.5 DISPOSAL OF DEMOLISHED MATERIALS:

A. Remove debris, rubbish and other materials resulting from demolition operations from building site. Transport and legally dispose of materials off site.

1. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning protection against exposure or environmental pollution. Immediately notify the Architect and Owner. Owner will have hazardous materials removed by and independent abatement contractor.

2. Burning of removed materials is not permitted on project site.

3.6 CLEAN-UP AND REPAIR:

A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.

B. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION 02 22 10

SECTION 03 10 00
CONCRETE FORMWORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Concrete Formwork Section (03 10 00).
2. Concrete Reinforcement and Accessories (Section 03 20 00).
3. Cast-In-Place Concrete (Section 03 30 00).

B. Work Included In This Section:

1. Extent of formwork is indicated by the concrete structures shown on the contract drawings and as required to place concrete.

2. Work shall include (except as specified elsewhere in the contract documents) providing formwork and shoring for all cast-in-place concrete and installation into the formwork items furnished by others, such as anchors, plates, inserts, and any other items embedded in concrete.

1.3 INDUSTRY STANDARDS:

A. Reference: Some products and execution are specified in this section by reference to published specifications of standards of the following (latest edition, with respective abbreviations used):

American Concrete Institute (ACI)
The American Society for Testing and Materials (ASTM)
U. S. Product Standards (PS)

B. Standard Specifications and Codes: The following specifications and codes form a part of this specification:

Publications of the American Concrete Institute:

ACI 347 "Recommended Practice for Concrete Formwork"
ACI 117 "Standard Tolerances for Concrete Construction and Materials"

1.4 SUBMITTALS:

A. Manufacturer's Data: Submit (for information only) manufacturer's specifications for proprietary materials and items as required, including form coatings, formwork facing material, jointing, reveals, etc., ties, and accessories.

B. Shop drawings for formwork structure, including the location of shoring and reshoring, are the responsibility of the Contractor and shall not be submitted to the Engineer.

C. Formwork Shop Drawings: Show formwork construction, including form-facing joints, rustications, construction and contraction joints, form joint-sealant details, form tie locations

and patterns, inserts and embedment's, cutouts, cleanout panels, and other items that visually affect cast-in-place architectural concrete.

D. Placement Schedule: Submit concrete placement schedule before start of placement operations. Include locations of all joints, including construction joints.

E. Samples: For each of the following materials:
1. Form-facing panels.
2. Form ties.
3. Form liners.
4. Exposed aggregates.
5. Coarse- and fine-aggregate gradations.
6. Chamfers and rustications.

F. Samples for Verification: Architectural concrete Samples, cast vertically, approximately 18 by 18 by 2 inches of finishes, colors, and textures to match design references. Include Sample sets showing the full range of variations expected in these characteristics.

PART 2 – PRODUCTS

2.1 FORM MATERIALS AND ACCESSORIES:

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

(a) High-density overlay, Class 1 or better.
(b) Medium-density overlay, Class 1 or better; mill-release agent treated, and edge sealed.
(c) Structural 1, B-B or better; mill oiled, and edge sealed.
(d) B-B (Concrete Form), Class 1 or better; mill oiled, and edge sealed.
(e) Form-Facing Panels for Exposed-Aggregate Finishes: Steel and glass-fiber-reinforced plastic, or other approved non-absorptive panel materials that provide continuous, true, and smooth architectural concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 1/2 inches to the plane of exposed concrete surface.

2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

F. Form Liners: Units of face design, texture, arrangement, and configuration [indicated] [to match design reference sample]. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent surface treatments of concrete.

G. Surface Retarder: Chemical liquid set retarder, for application on form-facing materials, capable of temporarily delaying final hardening of newly placed concrete surface to depth of reveal specified.

PART 3 – EXECUTION

3.1 DESIGN OF FORMWORK:

A. The Contractor shall be responsible for the design of all concrete formwork. Formwork shall be designed in accordance with ACI 347 unless noted.

B. Design, erect, support, brace, and maintain formwork so that it will safely support vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation, and position.

C. Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, stresses, lateral stability, and other factors pertinent to safety of structure during construction.

D. Support form facing materials by structural members spaced sufficiently close to prevent deflection. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities, and within allowable tolerances.

E. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.

F. Provide for openings, offsets, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work.

G. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

H. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

I. Chamfer exposed corners and edges unless otherwise indicated, or specified, using wood, metal, PVC or rubber strips fabricated to produce uniform lines and tight edge joints.

J. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

K. Limit deflection of form-facing panels to not exceed ACI 303.1 requirements.

1. In addition to ACI 303.1 limits on form-facing panel deflection, limit cast-in-place architectural concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as Class A, 1/8 inch
2. Construct forms to result in cast-in-place architectural concrete that complies with ACI 117

3.2 TOLERANCES: Formwork shall be constructed so as to ensure that the concrete surfaces will conform to the tolerances of Section 203.1 "Recommended Practice for Concrete Formwork" (ACI 347).

3.3 REUSE OF FORMS:

A. Clean and repair surfaces of forms to be reused in the work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to concrete contact surfaces as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces.

3.4 CLEANING AND TIGHTENING: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before concrete is to be placed. Tighten forms immediately after concrete placement as required to eliminate mortar leaks.

3.5 FORM COATINGS:

A. Coat form contact surfaces with form-coating compound before reinforcement is placed. Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond of adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds.

B. Do not allow excess form coating material to accumulate in the forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.6 EMBEDDED ITEMS: Set and build into the work anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings or instructions, and directions provided by suppliers of the items to be attached.

3.7 FORM REMOVAL: Formwork, not supporting concrete, may be removed 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided that curing and protection operations are maintained. Formwork for surfaces specified to be "rubbed" is to be removed within 24 hours after placement. Immediately after rubbing, curing is to be reinstated.

3.8 CONCRETE IN EARTH: Where trench excavation is used, and where sides of excavations are cut neatly in good, firm soil, side-forms may be omitted.

END OF SECTION 03 10 00

SECTION 03 20 00
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Concrete Formwork (Section 03 10 00)

2. Adhesive Concrete Anchors (Section 03 25 00)

3. Cast-In-Place Concrete (Section 03 30 00)

B. Work Included in this Section: Reinforcement for cast-in-place concrete (including bars, welded wire fabric, ties, and supports) as shown on drawings, and as specified herein.

1.3 QUALITY ASSURANCE:

A. References: Some products and execution are specified in this section by reference to published specifications or standards of the following (latest edition, with respective abbreviations used):

American Concrete Institute (ACI)

The American Society for Testing and Materials (ASTM)

American Welding Society (AWS)

Concrete Reinforcing Steel Institute (CRSI)

B. Standard References:

1. The current edition of the following standard references shall apply to the work of this section. Suffixes indicating date of issue are omitted from reference numbers used in the text of this section.

2. Publications of the American Concrete Institute:

ACI-301 "Specification for Structural Concrete for Buildings."

ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures.

ACI 318 "Building Code Requirements for Reinforced Concrete."

3. Publications of the AWS:

AWS D1.4 "Recommended Practice for Welding, Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction."

4. Publications of the CRSI:

"Manual of Standard Practice"

5. Publications of the ASTM:

ASTM A-82 "Specification for Cold Drawn Steel Wire for Concrete Reinforcement."

ASTM A184 "Specification for Steel Bar Mats for Concrete Reinforcements."

ASTM A185 "Specification for Welded Steel Wire Fabric for Concrete Reinforcement."

ASTM A615 "Specification for Deformed Billet-Steel Bars for Concrete Reinforcement."

ASTM A706 "Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement."

C. Building Code: North Carolina State Building Code, current edition with all amendments.

1.4 SUBMITTALS:

A. Shop Drawings:

1. Shop drawings shall be in accordance with ACI 315.

2. Only shop drawings checked and stamped "Approved by Contractor" will be accepted for review.

3. Show details, bar clearances, notes, and necessary information for placing of reinforcing steel.

4. Show wall and pier reinforcing in elevation. Include all pertinent details and schedules required to specify the reinforcing. Show welding requirements for welded bars.

5. Submit reinforcing shop drawings for review. Shop drawings shall include, but not be limited to, reinforcing layout, size location, quantities, lap lengths, required bends and other pertinent information related to the installation of the reinforcing steel.

B. Welding Certificates.

1.5 DELIVERY, STORAGE, HANDLING:

A. Reinforcing steel shall be delivered to project site properly tagged, bundled, and ready to place.

B. Reinforcing steel and welded wire mesh delivered to project site (and not immediately placed in forms), shall be protected from mud, excessive rust-producing conditions, oil, grease, or distortion.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Reinforcing Bars: New, deformed bars, conforming to ASTM A615- S1, Grade 60 as required on drawings. ASTM A706 for bars in welded applications.

B. Welded Wire Fabric: Welded wire fabric shall be electrically-welded, wire fabric of cold-drawn wire, of gauge and mesh as shown on drawings, or as required. Fabric shall conform to ASTM A185, Grade 60 or Grade 70. Provide in mat form.

C. Plain Smooth Dowels: Plain smooth dowels shall conform to ASTM A306 with a minimum yield stress of 40,000 psi.

D. Tie Wire: Shall be 16 gage, or heavier, black annealed, steel wire.

E. Accessories: Fabricate accessories from concrete, metal, plastic, or other materials accepted by the Engineer. Include spacers, ties, chairs, bolsters, and other devices required to properly support, space, and secure the reinforcing steel in its proper position in accordance with the Drawings and recommendations of the CRSI "Manual of Standard Practice". Chairs and other accessories shall be Class I or Class II in accordance with CRSI. Parts in contact with exposed concrete surfaces shall be either stainless steel (AISI 302 or 304) or have plastic coated legs. Locations and types of accessories shall be shown on the shop drawings. Chairs for all concrete reinforcing steel to be supported on soil shall be continuous high chairs with continuous longitudinal wires, or individual square plates, welded to the bottom of the chair legs. Use "Z" spacer bars between adjacent vertical reinforcing mats in walls. Use standees between top and bottom mats of reinforcing in footings.

2.2 FABRICATION:

A. Reinforcing steel shall be fabricated to shapes and dimensions indicated on drawings, and in compliance with applicable provisions of ACI 315 and ACI 318.

B. Bars shall be bent cold in shop. No bars shall be bent in field, unless specifically indicated on drawings.

C. Tolerances: Bars used for concrete reinforcement shall meet the following requirements for fabricating tolerances:

1. Sheared length: $\pm$ one inch.

2. Stirrups and ties: $\pm$ one-quarter inch.

3. All other bends: $\pm$ one inch

D. Fabrication of reinforcing steel prior to review and approval of shop drawings by Project Engineer shall be solely the responsibility of the Contractor.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS FOR REINFORCING:

A. Reinforcing shall be free from scale, loose rust, mud, or coatings which will reduce bond to concrete.

B. Bars with kinks or bends not shown on drawings shall not be placed. Heating of reinforcement for bending or straightening will not be permitted.

C. Minimum concrete cover for reinforcing shall be as shown on drawings and per ACI 318 standards:

1. 3" for concrete poured directly against the earth.

2. 2" for formed surfaces exposed to earth or weather.

3. 1" for formed slab or wall surfaces not exposed to weather.

3.2 PLACING OF REINFORCEMENT:

A. Tolerances: Bars shall be placed to the following tolerance: ± one-quarter inch.

B. Dowels: Place steel dowels as required on drawings by means of plywood templates. Place and anchor dowels securely before placing concrete.

C. Accessories:

1. Nails shall not be driven into formwork to support reinforcement. Turn tie wires into concrete, not toward exposed surfaces.

2. Space bar supports in accordance with ACI 315, ACI 301, and CRSI Manual of Standard Practice. Chairs for reinforcing steel to be supported on soil shall be spaced as necessary to prevent the legs from pressing into the soil, but no more than 5'-0" on center.

3. In walls, provide continuous slab bolsters spaced at 4'-0" o.c. maximum to support reinforcing off formwork. Use #4 "Z" spacer bars at 4'-0" o.c. each way between wall mats.

D. Securing Reinforcement:

1. Reinforcing bars shall be supported and wired together to prevent displacement by construction loads, or by placing of concrete, beyond tolerances as set forth hereinbefore.

2. Maintain metal reinforcement securely and accurately in place until concrete is placed.

3. Any and all disturbances of reinforcement from any cause whatsoever shall be corrected fully prior to placing of concrete. Damaged bar-supports and spacers shall be repaired or shall be removed and replaced.

4. Bars shall not be bent after being embedded in hardened concrete, unless indicated so on drawings.

5. When approved, welding of reinforcing steel shall conform to AWS D1.4. Do not weld at bend in a bar. Welding of cross bars shall not be permitted unless authorized by Project Engineer.

E. Welded Wire Mesh:

1. Install in longest practical lengths. Welded wire fabric shall be lapped at least 1 mesh plus end extension of wires, but not less than 6". Lace splices with tie wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

2. Wire mesh shall be placed so as to secure it positively at a position as indicated on Drawings.

3.3 SPLICES OF REINFORCEMENT:

A. Splices and offsets in reinforcements shall not be made at points of maximum stress.

B. Splices shall be approved by Engineer. Splices shall provide sufficient lap to transfer required stress.

C. Character and design of each splice shall conform to requirements of ACI 318. Minimum splice length shall be 36 bar diameters. See also plans for splice lengths.

3.4 FIELD QUALITY CONTROL:

A. Inspection of Placement of Reinforcing Steel:

1. Project Engineer shall be given advanced notice of not less than 24 hours prior to placing concrete to allow inspection of reinforcing steel.

2. Inspection of placement of reinforcement in a section will be made only after placement is complete for that section to be poured.

3. Such inspections shall not relieve Contractor of his responsibility to provide work in accordance with requirements of contract documents. Such inspections are for purpose of minimizing errors in field work.

END OF SECTION 03 20 00

SECTION 03 25 00
ADHESIVE CONCRETE ANCHORS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS: Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 1 Specification sections, apply to this section.

1.2 RELATED SECTIONS

A. Cast in Place Concrete (Section 03 30 00)

B. Structural Steel (Section 05 12 00)

1.3 SECTION INCLUDES

A. Furnishing and installing adhesive anchors with washers and nuts into holes drilled into the existing reinforced concrete as indicated on the drawings and as specified herein.

B. Equipment required for drilling the holes and for locating the existing embedded reinforcing steel.

C. Equipment required for mixing, proportioning and dispensing the epoxy gel into holes drilled for adhesive anchors.

D. Identifying and locating existing reinforcing steel with magnetic equipment, pilot holes, or other means prior to drilling holes for anchors.

E. Items of testing, quality control, and evaluation of in-place adhesive anchors.

1.4 SUBMITTALS

A. General: Submit in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

1. Product specifications with recommended design values and physical characteristics for epoxy dowels and threaded rods.

2. Samples: Representative length and diameters of each type anchor shown on the Drawings.

3. Quality Assurance Submittals:

a. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

b. Certificates:

i. ICBO ES Evaluation Reports for use in masonry construction and concrete construction as applicable.

4. Manufacturer's installation instructions.

5. Installer Qualifications & Procedures: Submit installer qualifications. Submit a letter of procedure stating method of drilling, the product proposed for use, the complete installation procedure, manufacturer training date, and a list of the personnel to be trained on anchor installation.

B. Closeout Submittals: Submit the following:

1. Record Documents: Project record documents for installed materials in accordance with Division 1 Closeout Submittals Section.

1.5 QUALITY ASSURANCE

A. Qualifications:

B. Installer Training: Conduct a thorough on-site training with the manufacturer or the manufacturer's representative for the contract on the project. Anchors installed prior to completion of the training will be rejected and subject to load testing at contractor's expense or removal and replacement. Training to consist of a review of the complete installation process for each type of epoxy embedded anchor types, to include but not limited to:

1. Hole drilling procedure

2. Hole preparation & cleaning technique

3. Adhesive injection technique & dispenser training / maintenance

4. Anchor preparation and installation

5. Proof loading/torquing

C. Certifications: Unless otherwise authorized by the Engineer, anchors shall have one of the following certifications:

1. ICBO ES Evaluation Report indicating conformance with current applicable ICBO ES Acceptance Criteria.

2. ICC ES Evaluation Report

D. Source: All epoxy material and specialty anchors for this project shall come from a single source.

1.6 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division 1 Section–Product Storage and Handling Requirements.

1. Store anchors and epoxy adhesive in accordance with manufacturer's special requirements with respect to temperature, exposure to sunlight, and shelf life.

PART 2 – PRODUCTS

2.1 MATERIALS:

A. Fasteners and Anchors:

1. Stainless Steel Threaded Bolts: ASTM F593, for exterior use.

2. Stainless Steel Nuts and Washers: ASTM F594, for exterior use.

3. High strength rod material meeting the requirements of ASTM A193, Grade B7, for interior use.

4. Standard nut material meeting the requirements of ASTM F563, for interior use.

5. Standard washers meeting the requirements of ASTM F436, for interior use.

B. Cartridge Injection Adhesive Anchors: Threaded steel rod, inserts or reinforcing dowels, complete with nuts, washers, polymer or hybrid mortar adhesive injection system, and manufacturer's installation instructions. Type and size as indicated on Drawings.

1. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel rods conforming to ASTM A36 or ASTM A193 Type B7 with zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SCI). Provide nuts and hardened steel washers in accordance with ASTM A563 and ASTM F436.

2. Exterior Use: As indicated on the Drawings, provide stainless steel anchors. Stainless steel anchors shall be AISI Type 304 stainless steel provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. All nuts shall conform to ASTM F594 unless otherwise specified

3. Refer to the construction drawings and notes for applicable anchor types and sizes. If not otherwise indicated on the drawings or where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Engineer, provide the following:

a. Hilti HAS threaded rods with RE 500 V3 Injection Adhesive Anchoring System for anchorage to cracked concrete, ICC-ES AC308, or approved equal.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Drilled-In Anchors:

1. Unless noted otherwise drill holes for anchors with rotary impact hammer drills using carbide-tipped bits. Drill bits shall be of diameters as specified by the anchor manufacturer. Unless otherwise shown on the Drawings, all holes shall be drilled perpendicular to the concrete surface.

a. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines, etc.

3. Perform anchor installation in accordance with manufacturer instructions.

4 Observe manufacturer recommendations with respect to installation temperatures for cartridge injection adhesive anchors and capsule anchors.

3.2 REPAIR OF DEFECTIVE WORK

A. Remove and replace misplaced or malfunctioning anchors. Fill empty anchor holes and patch failed anchor locations with high-strength non-shrink, nonmetallic grout. Anchors that fail to meet proof load or installation torque requirements shall be regarded as malfunctioning.

3.3 FIELD QUALITY CONTROL

A. Testing: 5% of each type and size of drilled-in anchor shall be proof loaded by an independent testing laboratory. Testing of the anchors shall be performed prior to installation of other work attaching to or around the anchors. Adhesive anchors shall not be torque tested unless otherwise directed by the Engineer. If any of the tested anchors fail to achieve the specified torque or proof load within the limits as defined on the Drawings, all anchors of the same diameter and type as the failed anchor shall be tested, unless otherwise instructed by the Engineer. The cost of these additional tests shall be borne by the Contractor.

1. Torque shall be applied with a calibrated torque wrench.

2. Proof loads shall be applied with a calibrated hydraulic ram. Displacement of adhesive and capsule anchors at proof load shall not exceed D/10, where D is the nominal anchor diameter.

B. Minimum anchor embedments shall be as shown on the Drawings.

END OF SECTION 03 25 00

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. Section includes cast-in-place concrete as shown on drawings, as specified herein and as required to complete this work, including formwork, reinforcement, concrete materials, mixture design, mixing, transporting, placing, finishing, curing, quality control, quality assurance and property evaluation for the following.

1. Suspended slabs.
2. Concrete toppings.
3. Building frame members.
4. Building walls.

B. Related Work Specified Elsewhere:

1. Concrete Formwork (Section 03 10 00)
2. Concrete Reinforcement (Section 03 20 00)

1.3 DEFINITIONS:

A. Cementitious Materials: Materials conforming to this specification and have cementing value when used in concrete either by themselves, such as portland cement, other hydraulic cements or blended hydraulic cements, or such materials in combination with fly ash, other raw or calcined natural pozzolans, silica fume and/or slag cement.

B. Concrete: Mixture of cementitious materials, aggregates and water, with or without fibers or chemical admixtures, as required by this specification.

1.4 INDUSTRY STANDARDS:

A. Some products and execution are specified in this section by reference to published standards of the following:

American Concrete Institute (ACI)

American Society for Testing and Materials (ASTM)

American Welding Society (AWS)

Concrete Reinforcing Steel Institute (CRSI)

National Ready-Mix Concrete Association (NRMCA)

Concrete Polishing Association (CPAA)

1.5 MANDATORY REFERENCED STANDARDS:

A. When referenced in text, standards and codes applying to this work shall conform to the latest version. Suffixes indicating date of issue are omitted in text.

B. Work on this project shall conform to all requirements of the following documents, published by the American Concrete Institute, Farmington Hills, except as specifically modified by these Contract Documents. Where conflicts arise between mandatory references, the more stringent requirement shall apply. Suffixes indicating date of issue are omitted elsewhere in text.

ACI 117-06	Specifications for Tolerances for Concrete Construction and Materials
ACI 301-05	Specification for Structural Concrete – Sections 1-5
ACI 305.1-06	Specification for Hot-Weather Concreting
ACI 306.1 -90	Standard Specification for Cold-Weather Concreting
ACI 308.1 -98	Standard Specification for Curing Concrete

1.6 SUBMITTALS:

A. Submittals are to include information required by MANDATORY REFERENCE STANDARDS in addition to information below.

B. Product Data and MSDS: For each type of product indicated.

C. Design Mixtures:
1. For each concrete mixture, submit the proposed mixture design with information necessary to support conformance to these specifications. Submit alternate design mixtures at no additional cost to the owner, when characteristics of materials, Project conditions, weather, test results, material availability, design expiration per these documents or other circumstances warrant adjustments or re-design.
2. Submit third party fresh and hardened concrete testing results demonstrating conformance of the mixture to this specification.
3. Submit material certificates, material quality control information and samples per this specification.
4. Indicate ranges of admixtures for production concrete and amounts of mixing water to be withheld for later addition at Project site (if approved by Engineer)

D. Concrete Production Field Quality Control Reports (Submitted monthly to Engineer):
1. Submit material certificates, field quality control information and samples per this specification.

E. Steel Reinforcement Shop Drawings: Refer to Section 03 20 00.

F. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Engineer.

G. Samples: For each of the following materials:
1. Form-facing panels.
2. Form ties.
3. Form liners.
4. Exposed aggregates.
5. Chamfers and rustications.

6. Concrete materials, collected in accordance with ASTM C 183 and ASTM D 75, if requested by the Engineer.

H. Samples for Verification: Architectural concrete Samples, cast vertically, approximately 18 by 18 of finishes, colors, and textures to match design reference sample. Include Sample sets showing the full range of variations expected in these characteristics.

I. Qualification Data: For installers, manufacturers, producers and testing agencies.

J. Material Certificates: For each of the following, signed by manufacturers demonstrating conformance to applicable standards and this specification:

1. Cementitious materials.
   a. Report alkali contents for supplementary cementitious materials.
2. Admixtures
   a. To include compatibility statements for each admixture to document appropriateness for use with other constituents.
3. Aggregates
4. Fiber reinforcement.
5. Curing compounds.
6. Floor and slab treatments.
7. Bonding agents.
8. Adhesives.
9. Semirigid joint filler.
10. Joint-filler strips.
11. Repair materials.

K. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements (as necessary to satisfy requirements for each individual mixture design proposed for the work):
1. Historical and current quality control test records for cementitious materials and aggregates.
2. Aggregate testing data and indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity for all mixtures.

L. Quality Control Plan, Plan of Action And Quality Control Records

M. Minutes of pre-installation conference

N. Repair procedures

1.7 QUALITY ASSURANCE:

A. Superintendant: Qualified superintendant with at least 5 years experience with similar types of concrete placements.

B. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

C. Cementitious Materials Testing Agencies: Testing for cementitious materials as part of the quality control plan and for material certification must be conducted by agencies that have participated in the reference sample and laboratory inspection programs of Cement and Concrete Reference Laboratory (CCRL). Proof of participation and current involvement is required.

D. Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

E. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
3. Laboratory testing for hardened concrete other than compressive strength testing shall be a firm specializing in the specific test(s).

F. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

G. Comply with the Mandatory Reference Standards Above unless modified by requirements in the Contract Documents:

H. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

I. Mockups: Prior to production work, mock-ups either at actual placement locations per the scope or at alternative locations shall be prepared by the Contractor. Cast concrete for formed surface to demonstrate placement, typical joints, surface finish, texture, tolerances, and standard of workmanship. Equipment, personnel and operations intended for use during production shall be implemented in the mock-up.

1. Before casting architectural concrete, build mockups to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work.

2. Demonstrate curing, cleaning, and protecting of cast-in-place architectural concrete, finishes, and contraction joints, as applicable.

3. In presence of Architect, damage part of the exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces.

4. Obtain Architect's approval of mockups before casting architectural concrete

5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

J. Field Sample Panels: After approval of verification sample and before casting architectural concrete, produce field sample panels to demonstrate the approved range of selections made under Sample submittals. Produce a minimum of three sets of full-scale panels, cast vertically, approximately 48 by 48 by 6 inches minimum, to demonstrate the expected range of finish, color, and texture variations.

1. Locate panels as indicated or, if not indicated, as directed by Architect.

2. Demonstrate methods of curing, aggregate exposure, sealers, and coatings, as applicable.

3. In presence of Architect, damage part of an exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces.

4. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.

5. Demolish and remove field sample panels when directed.

K. Pre-installation Conference: Conduct conference at Project site.

1. At least 15 days before submitting design mixtures, hold a pre-construction conference to review the design mixture and detailed procedures for ensuring quality of concrete material and proper concrete construction. Provide a detailed quality control plan for procedures and testing meeting the requirements of these specifications. Record detailed minutes of the meeting and distribute to all parties in attendance within five (5) days. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

   a. Contractor's superintendents.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Independent testing agency responsible for field quality assurance testing.
   d. Ready-mix concrete manufacturer.
   e. Concrete subcontractor.
   f. Special concrete finish subcontractor
   g. Reinforcing installers
   h. Designer
   i. Special Inspector
   j. Other involved parties

2. Review Quality Control Plan

1.8 CONTRACTOR QUALITY CONTROL

A. The Contractor must implement a quality control plan:
   1. Contractor shall designate persons or third party to perform quality control. Testing shall be done by persons qualified per these specifications.
   2. Procedures
      a. Special inspection and testing and inspecting agency procedures for field quality assurance, contractor quality control, concrete finishes and finishing procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, anchor rod and anchorage device installation tolerances, steel reinforcement installation, concrete repair procedures, concrete protection, workforce, placement logistics and contingencies for equipment failures or inclement weather, material transportation to site, verification of subcontractor and producer work and/or materials.
   3. Production Testing
      a. Frequency for testing to verify fresh concrete property conformance in production shall be included in the Quality Control Plan. Quality control records shall be submitted.

4. Concrete Production Facilities
    a. Provide plan and records for demonstrating conformance to ASTM C 94 and must have current NRMCA “Certification of Ready Mixed Concrete Production Facilities” for the batch plant and fleet.
5. Cementitious Materials
    a. Mill certifications must be current and contain all standard and optional compositional and physical data (per associated ASTM standard) demonstrating conformance. Cementitious Materials Producer quality control testing frequency must be daily (maximum) unless otherwise approved by the Engineer and shall demonstrate compliance with specifications. The general procedures for testing and reporting shall follow ASTM C 1451 or other approved method.
    b. Historical mill certifications and producer quality control/uniformity records for specified properties (per the applicable ASTM standard) of all cementitious materials for a period dating from the time of design to six months prior to design.
    c. Mill certifications and producer quality control/uniformity records for all cementitious materials.
6. Aggregates
    a. Quality control testing must be at a frequency no greater than daily for coarse and fine aggregate cleanliness (ASTM C 117) and coarse aggregate grading (ASTM C 136) and twice per day for fine aggregate gradation (ASTM C 136). The general procedures for testing and reporting shall follow ASTM C 1451 or other approved method. Sampling locations shall be detailed in the quality control plan and shall represent conditions in the mixture.
    b. Method and frequency of moisture content testing shall be detailed in the quality control plan. In-line moisture meters for fine aggregate, if used, must be calibrated at least once per shift, minimum. Moisture content of coarse aggregates must be tested at least once per day or when conditions change. Fine aggregates must be tested once every four (4) hours minimum, or when conditions change.
    c. Include contingency procedures for adverse weather conditions at stockpiles and methods to maintain consistency in materials.
    d. Historical aggregate quality control data demonstrating conformance to specifications for a period dating from the time of design to six months prior to design.
    e. Quality control data for coarse and fine aggregates during construction.
    f. Quality control plan for use of non-standard aggregate gradations if appropriate.
7. Concrete Design Trial Mixtures and Production Mixtures
    a. Records of all concrete trials and placements showing exact location of placement, date and time of placement, site-specific environmental conditions during placement, including relative humidity, air temperature and wind speed as required in these specifications, quantity of placement, class of concrete placed, curing temperatures, verification of moist curing measures and other quality control records. Submit mandatory and optional batch ticket information listed in ASTM C 94 Section 13 for each concrete batch. Provide clear indication of materials added to the concrete mixture.
    b. Indicate ranges of admixtures for production concrete and amounts of mixing water to be withheld for later addition at Project site (if approved by Engineer)

1.9 DELIVERY, STORAGE, AND HANDLING:

A. All materials to be stored per manufacturer’s written requirements and in a manner to prevent contamination, damage, or degradation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 CONCRETE MATERIALS:

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project unless approved in writing by the Engineer:

1. Portland Cement: ASTM C 150, Type II or Type I/II, gray. Use Type V gray, if indicated or directed when concrete is in contact with sulfate in soil or water. The following supplemental cementitious materials are permitted for use:
   a. Supplementary Cementitious Materials (SCM's):
      1) Fly Ash: ASTM C 618, Class F. Loss on ignitions (LOI) shall not be greater than 3% and shall not vary by more than +/- 1%. Fly ash shall meet the optional physical requirements of ASTM C 618. Historical ASTM C 1451 uniformity records for a period of at least six months prior to design and throughout construction from the producer must demonstrate conformance.
      2) Slag Cement: ASTM C 989, Grade 80 or Grade 100. Slag cement shall not qualify as Grade 120 unless permitted by the Engineer in writing.
      3) Silica Fume: ASTM C 1240, including optional physical uniformity requirement.
      4) Other SCM's conforming to ASTM C 618 may be submitted for evaluation.

2. Blended Hydraulic Cement: When permitted, ASTM C 1157 Cement Type GU, MS, MH, or ASTM C 595, Type IS, portland blast-furnace slag or Type IP, portland-pozzolan cement. Conform to maximum supplementary cementitious materials content in the blended cement provided in ACI 301 if exposed to deicing salts.

B. Aggregates: Provide individual aggregates from a single source throughout the project. Each source shall be individually stockpiled and handled in a manner to minimize segregation. Provide service record data of at least 10 year's satisfactory service in similar application and service conditions using similar aggregates and cementitious materials. Aggregate sources that exhibit potential for alkali-silica reactivity with proposed cementitious materials shall not be used. Provide documentation that one of the two following criteria are met, as tested by a qualified third-party laboratory on a representative sample of each aggregate source:

1. ASTM C 1260 mortar bar expansion is less than 0.13 percent at 28 days
2. ASTM C 1567 mortar bar expansion with job cementitious materials is less than 0.13 percent at 28 days. ASTM C 1567 to be used only if the sodium oxide equivalent alkalis are less than 4 percent in supplementary cementitious materials. Alternative approved methods to be used if requirement not met.

C. Normal-Weight Aggregates: ASTM C 33 coarse and fine aggregates, Class 4M coarse aggregate or better, graded, unless otherwise permitted. Use Class 5M coarse aggregate for architectural concrete, as specified, unless otherwise permitted by the Engineer. Aggregate certification is valid for 90 days from the date of testing. Quality control records for gradation and cleanliness shall not exceed ASTM C 33 limits more than once in five consecutive tests prepared for quality control, except that the fine aggregate fineness modulus shall not deviate more than 0.2 from the base fineness modulus per ASTM C 33 for any test.

1. Nominal maximum size of coarse aggregate. Nominal maximum sizes indicated in mixture design requirements shall be used, provided that requirements of ACI 301 are met:
2. Fine Aggregate shall conform to the specific sieve analysis limits of ASTM C 33 Section 6 unless otherwise permitted. Fine aggregates shall be clean, sharp, natural and free from loam, clay, lumps or other deleterious substances.
3. The gradation limits of ASTM C 33 may be waived at the discretion of the Engineer provided that it can be demonstrated that a more optimal gradation is achieved, and gradation control can be maintained. Intermediate sized aggregates may be used. Documentation of optimization should include Individual Percent Retained Chart, Coarseness Factor Chart, 0.45 Power Curve, and dry-rodded unit weight testing. Submit information to show method used and plan for quality control if alternate gradations are used.

D. Lightweight Aggregate: ASTM C 330, 1-inch (25-mm) or 3/4-inch (19-mm) nominal maximum aggregate size, as specified. Aggregates must have a record of successful use in concrete applications with documented durability characteristics in for the application. Subject to conformance, Stalite Rotary Kiln Expanded Lightweight Aggregate or approved equal will conform to specifications.

1. Aggregates shall be handled in a manner recommended by the supplier.
2. Where lightweight concrete is specified, “Sand-Lightweight Concrete” shall be used consisting of a low density coarse aggregate and normal density sand.

E. Water: ASTM C 94 and potable, or ASTM C 1602.

F. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

G. Color: As indicated by manufacturer's designation] [Match Architect's sample] [As selected by Architect from manufacturer's full range.

2.3 ADMIXTURES:

A. All admixtures shall be used in strict conformance with manufacturer’s written requirements. Manufacturer(s) must certify that admixtures are compatible with other constituents in mixture. Admixtures shall be used as indicated in drawings, permitted by the Engineer, or necessary for design, as applicable. All admixtures are subject to approval by the Engineer.

B. Air-Entraining Admixture: Air entraining admixture shall conform to ASTM C 260 and be vinsol resin-based unless otherwise permitted by the Engineer. The Contractor shall submit an alternative if appropriate due to compatibility issues with other admixtures.

C. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride. All admixtures shall be non-corrosive and contain only trace amounts of deleterious halides. All admixtures shall be from a single source unless otherwise permitted by the Engineer.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
7. Accelerating or Water-Reducing and Accelerating Admixtures: ASTM C 494 Type C or E, respectively, shall be non-chloride, non-corrosive, and only used if permitted by the Engineer in writing.

D. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C. Use only if permitted by the Engineer in writing.

1. Products: Subject to compliance with requirements:

a. BASF Construction Chemicals - Building Systems; Rheocrete CNI.
b. Grace Construction Products, W. R. Grace & Co.; DCI.
c. Sika Corporation; Sika CNI.

E. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete. Use only if permitted by the Engineer in writing. Available products that may be incorporated into the Work include, but are not limited to, the following:

1. Products: Subject to compliance with requirements:

a. BASF Construction Chemicals - Building Systems; Rheocrete 222+.
b. Grace Construction Products, W. R. Grace & Co.; DCI-S.
c. Sika Corporation; FerroGard 901.

F. Specialty admixtures including shrinkage-reducing admixtures (SRA), alkali-silica reaction inhibiting admixtures (ASRIA), viscosity-modifying admixtures (VMA) and durability Enhancing Admixtures (DEA) must have data documenting their effectiveness and compatibility with other admixtures, have a proven field history with similar job materials and be approved by the Engineer.

1. Self-Consolidating concrete (SCC): High-range water reducing admixture shall conform to ASTM C 494 Type F (or ASTM C 1017 Type I), be polycarboxylate-based, and appropriate for use in SCC, as indicated by the manufacturer.

G. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.
1. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

2.4 CURING MATERIALS:

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry, clean and free of materials injurious to cement or concrete or that will mar the surface. Burlap shall be stored dry and rinsed with clean water prior to application.

B. Moisture-Retaining Cover: ASTM C 171, 10- mil polyethylene film or white burlap-polyethylene sheet. Use black when required per ACI 308.1

C. Water: Clean, potable and non-chloride bearing.

D. Waterborne, monomolecular film forming evaporation retarders and finishing aids are strictly prohibited unless permitted in writing by the Engineer. If permitted, the type with supporting documentation and proposed area shall be submitted to the Engineer for review. If used at an area to receive coating or adhered membrane, compound must be certified by manufacturer to not interfere with bonding of floor covering.
   1. Clear/White, Waterborne, Non-staining, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type II, Class A.

2.5 RELATED MATERIALS:

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork. Do not place asphaltic materials in contact with PVC, separate with EPDM.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80, or aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

   1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Reglets: Fabricate reglets of not less than 0.0217-inch- thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

F. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336-inch-thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

G. Vapor Barrier: Vapor Barrier must have the following qualities:

   1. Perm rating less than or equal to 0.012 perms (WVTR 0.006) as tested by ASTM E 96
   2. ASTM E 1745 Class A (Plastics)
   3. Vapor Barrier Products

H. Vapor Barrier Accessories: must have the following qualities:

   1. Seam Tape: Water Vapor Transmission Rate (VTR): ASTM E 96 - 0.3 perms or lower
   2. Vapor Proofing Mastic VTR: ASTM E 96 - 0.3 perms or lower
   3. Pipe Boots: Construct from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

2.6 REPAIR MATERIALS:

A. Repair Materials shall have documentation to show compatibility with substrate materials, shall be specially formulated and proportioned for the specific use, and shall provide a durable repair. Conform with ACI 301.

2.7 CONCRETE MIXTURES, GENERAL:

A. Prepare design mixtures for each type of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301. Submit written reports of each proposed mix for each class of concrete prior to start of work to document that requirements have been met. Include up to date sieve analyses and concrete strength tests. Do not begin concrete production until mixes have been reviewed and approved by the Engineer.

1. Concrete mixture designs shall be considered valid for 183 days from the date of trial batching. Mixtures shall be re-certified through testing prior to concrete placement after the expiration date.

2. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

3. Unless otherwise noted or permitted by the Engineer, strength requirements shall be based on 28-day compressive strength tests in accordance with ACI 301.

4. Required compressive strength of the design mixture shall be based on statistical methods or laboratory trial requirements to exceed the specified concrete compressive strength. All other required hardened concrete properties specified for design shall be based on actual test values.

5. Design mixes shall be proportioned using the maximum specified slump and within 3 ^{o}F of the maximum temperature to be used during production. Trials used to prepare specimens for mixture qualification shall be completed with full scale trucks with at least 5 cubic yards of concrete and in a manner similar to that expected during production. Material proportions for the trial shall be used as the basis for tolerances in production. Method of placement shall be considered and accounted for in developing the mixture design.

6. If a self-consolidating concrete mixture is proposed for use, the Contractor must submit the mixture design, appropriate documentation for fresh concrete properties and stability and hardened concrete stability for review. An on-site program must be proposed for quality control.

B. Cementitious Materials: Conform to ACI 301. Use fly ash, pozzolan, ground granulated blast-furnace slag, silica fume or other supplementary cementitious materials as needed to achieve required properties.

C. Limit acid-soluble, chloride-ion content in hardened concrete to 0.08 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions. Do not use admixtures that have not been incorporated and tested in the accepted mixtures, unless otherwise authorized by the Engineer in writing.

1. Use water-reducing, high-range water-reducing or plasticizing admixtures in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures or other adverse placement conditions.
3. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
4. Do not use accelerating admixtures unless permitted by the Engineer in writing.
5. Use of admixture is subject to approval by the Engineer.

E. Air entraining admixtures shall be used for all concrete potentially exposed to freezing and thawing or subjected to hydraulic pressure.

1. Entrained air shall be 6% +/- 1.5%. The water cement ratio for all concrete exposed to freezing and thawing shall not exceed 0.45.
2. Fly ash is not permitted in air-entrained concrete.

2.8 SLUMP:

A. Concrete shall be proportioned to have a specified slump of 4" at point of placement (with applicable tolerances) unless otherwise permitted. Requests shall be submitted to the engineer. Lower or higher values may be used if indicated by the Contractor and the Contractor can demonstrate the mixture can be well placed and consolidated during the mock-up without segregation.

B. Concrete containing high range water reducers shall have at least 2" of initial slump prior to addition of high range water reducing admixture. Slump shall not at any time exceed 8" after addition of admixtures, unless otherwise approved. All admixtures shall be added at the plant unless otherwise permitted in writing by the Engineer. Only if permitted, the addition of the high range water reducer shall be by a truck mounted mechanical dispenser or by a qualified certified concrete technician of the concrete supplier. The admixture shall not be manually dispensed by the concrete truck driver. After the addition of the high range water reducer, the concrete shall be rotated at maximum speed for a minimum of three minutes (45 revolutions minimum). The contractor must demonstrate that concrete properties are not adversely affected by on-site addition. Specific quality control measures must be proposed by the Contractor.

2.9 CONCRETE MIXTURES FOR BUILDING ELEMENTS:

A. Foundations: Proportion structural normal weight concrete as follows:
1. Nominal Maximum Size Coarse Aggregate: 3/4-inches.
2. Minimum Design Compressive Strength, f'c (ASTM C 39): 3000 psi at 28 days (provide applicable data to substantiate the chosen required f'cr)
3. Maximum Water-Cementitious Materials Ratio: 0.5
4. Air Content at Point of Placement (ASTM C 173): 3 percent max
5. Maximum Allowable Slump at Point of Placement (ASTM C 143): 4" +/- 1"
   a. Exception: see requirements for addition of high range water reducer for concrete to be pumped into place.

B. Slabs, Walls, All other concrete: Proportion structural normal weight concrete as follows:
1. Nominal Maximum Size Coarse Aggregate: 3/4-inches.
2. Minimum Design Compressive Strength, f'c (ASTM C 39): 4000 psi at 28 days (provide applicable data to substantiate the chosen required f'cr)
3. Maximum Water-Cementitious Materials Ratio: 0.45
4. Air Content at Point of Placement (ASTM C 173): 3 percent max
5. Maximum Allowable Slump at Point of Placement (ASTM C 143): 4" +/- 1"
   a. Exception: see requirements for addition of high range water reducer for concrete to be pumped into place.

C. Exterior Exposed Concrete: Proportion structural normal-weight concrete as follows:
1. Nominal Maximum Size Coarse Aggregate: 3/4-inches.
2. Minimum Design Compressive Strength, f'c (ASTM C 39): 4500 psi at 28 days (provide applicable data to substantiate the chosen required f'cr)
3. Maximum Water-Cementitious Materials Ratio: 0.42
4. Air Content at Point of Placement (ASTM C 173): 6 percent +/- 1.5%
5. Maximum Allowable Slump at Point of Placement (ASTM C 143): 4" +/- 1"

a. Exception: see requirements for addition of high range water reducer for concrete to be pumped into place.

D. Grout for Masonry: Proportion structural normal-weight grout as follows:
1. Nominal Maximum Size Coarse Aggregate: 3/8-inches.
a. Fine or course grout shall be used for masonry fill sized appropriately for width of grout cavity per ACI 530.
2. Design Compressive Strength, f'c (ASTM C 404): 3000-5000 psi at 28 days
3. Maximum Water-Cementitious Materials Ratio: 0.60
4. Masonry Wall fill shall conform to ASTM C-476.
5. Use grout with superplasticizer or polycarboxylate additives for masonry wall fill.
6. Maximum Allowable Slump at Point of Placement (ASTM C 143): 9" +/- 2"

2.10 CONCRETE MIXING:

A. Batching: Concrete shall be mixed at central batch plants or truck-mixed at central batch plants and transported to the site as specified herein, unless otherwise permitted. Concrete production facilities and delivery fleet must comply with the requirements of ACI 301 and must have current NRMCA batch plant and fleet certification. Plants must have sufficient capacity to produce concrete of the quantity and quality as specified herein. All plant facilities are subject to inspection by the Engineer or his Agent. Plants must be routinely inspected by the ready-mix producer to verify that the plant is in conformance with ASTM C 94 and that scales and measures are accurate. The batchman shall have clear view of material addition and admixture measures during batching. Trucks shall be routinely inspected for hardened concrete on fins and worn fins. Information shall be submitted as part of the quality control records.

B. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116 (if applicable), and furnish batch ticket information, including non-standard information in ASTM C 94 Section 13. During hot weather or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 will be required as follows, unless otherwise permitted:

1. When air temperature is between 81 and 89.9 deg F, reduce mixing, delivery and placement time from 1-1/2 hours to 1 hour.
2. When air temperature is 90 deg F or above, reduce mixing, delivery and placement time to 45 minutes.

C. Concrete batches shall be 5 yds^3 minimum. Tolerances for scale

D. Concrete delivered to the project with slump greater than the maximum specified shall be rejected. Slumps that are less than the specified may be increased by adding water to the mix to bring the mix to the specified slump, provided the following conditions are met:

1. The specified water to cementitious materials ratio is not exceeded.
2. The batch ticket indicates the amount of water withheld from the mix so that the design water-cement ratio is not exceeded.
3. No high-range water reducing admixtures have been added at the job-site.
4. Any water that is added to mix is done in the presence of the Engineer or the owner's testing agent.
5. The amount of water added is documented and provided to the architect.
6. The amount of water added does not exceed 3 gallons of water per yard of concrete.
7. Slump and air content tests are made after the water is added.
8. Written approval is provided by the concrete supplier.

E. Ice, if used, shall be potable, subject to the same requirements of water and accurately measured for addition into the mixer within the tolerances of ASTM C 94.

F. Water shall not be added to structural lightweight concrete at the job-site unless permitted by the Engineer.

G. Maintain equipment in proper operating condition, with drums cleaned before charging of each batch. Wash water shall be fully discharged prior to beginning a new batch unless permitted by the Engineer and optional tests per ASTM C 94 are performed at a frequency of at least once per week. Schedule delivery of trucks in order to prevent delay of placing after mixing.

H. Maximum concrete temperature at point of placement is 90 ^{o}F unless otherwise permitted.

PART 3 - EXECUTION

3.1 EMBEDDED ITEMS:

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.
4. Do not embed any foreign items in concrete. Do no embed aluminum unless indicated. Do not embed conduit unless indicated.

3.2 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches (150 mm) minimum and seal with manufacturer's recommended tape.

B. Granular Course: Install granular fill layer or layers as indicated, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch (0 mm) or minus 3/4 inch (19 mm).

3.3 JOINTS:

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Except where indicated to be unbonded, roughen surfaces of hardened concrete at all vertical construction joints. Clean surface of laitance, coatings, loose particles, and foreign matter to expose aggregate.
3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete. Provide keyways in all construction joints in footings in walls and at junctions of walls and footings.

4. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as shown and no more than 36 times the wall thickness. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
7. At joints between foundation systems and walls, and elsewhere, unless otherwise specified herein, dampen, but do not saturate, the roughened and cleaned surface of set concrete immediately before placing fresh concrete. Use an approved bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces in accordance with manufacturers requirements only if directed or indicated.

C. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.4 PREPARATION OF EQUIPMENT AND PREPARATION OF PLACE OF DEPOSIT:

A. Before placing concrete, all equipment for mixing and transporting and placing concrete shall be cleaned, all debris and ice removed from spaces to be occupied by the concrete, forms thoroughly cleaned of soil, ice, or other coatings which will prevent proper bond, reinforcement shall be securely tied in place and expansion joint material, anchors, and other embedded items shall be securely positioned.

B. Semi porous subgrade shall be sealed in an approved manner.

C. Hardened concrete and foreign materials shall be removed from the conveying equipment. All equipment shall be checked for potential areas of contamination to the concrete during placement from abrasion or breaches in liquid conduits.

D. Before placing concrete, the formwork installation, reinforcing steel, and items to be embedded or cast in must be complete. Notify other crafts involved in ample time to permit the installation of their work; cooperate with other trades in setting such work, as required. Notify Engineer upon completion of installation of all reinforcing in ample time to permit inspection of the work.

3.5 CONCRETE PLACEMENT:

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by the Engineer.

C. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practical by methods which will prevent separation or loss of ingredients and in a manner, which will assure that quality concrete is installed.

D. Conveying equipment shall be of size and design to insure a continuous flow of concrete at the delivery end.

E. Use approved tremies for vertical placements unless otherwise permitted. Do not allow concrete to freefall distances that may cause segregation.

F. Screed concrete which is to receive other construction to the proper level to avoid excessive skimming or grouting.

G. Do not use concrete which has become non-plastic and unworkable or does not meet the required quality control limits, or which has become contaminated by foreign material. Do not use concrete that is non-uniform or contains lumps or balled material. Remove rejected concrete from the project site and dispose of in an acceptable location.

H. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit in a manner to avoid inclined construction joints. Deposit concrete as nearly as possible to its final location to avoid segregation. Do not subject concrete to any procedure that will cause segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301. Consolidate in a manner to avoid segregation.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
4. For mass concrete, as indicated by the Engineer, deposit concrete in forms in horizontal layers not deeper than 24”.

I. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

J. Remove temporary spreaders in forms when concrete placing has reached the elevation of such spreaders.

K. All concrete shall be consolidated by mechanical vibration. Consolidate concrete placed in forms or on steel deck by mechanical vibrating equipment supplemented by hand spading, rodding, and tamping. Vibration of forms and reinforcing steel will not be permitted. The use and type of vibrators shall be in accordance with ACI 301.

L. Bring surface of slabs to the correct elevations with a straight edge and strike off. Use bull floats or darbies to smooth the surface, leaving it free of humps and hollows. Do not sprinkle water on the plastic surface. Do not work bleed water or sprinkled water into the surface. Do not disturb the surface prior to beginning the finish operation.

M. Pumped concrete shall be appropriately proportioned so that concrete properties do not drastically change through the pump. The pumping operations shall not create segregation or otherwise negatively affect the concrete. Comply with the following:
1. Concrete pumps shall be positive piston type pumps. No squeeze pumps will be permitted.
2. Concrete contaminated with pumping aids shall be discarded. Priming mixtures not in conformance with these specifications shall be discarded.
3. Fresh concrete testing shall be conducted at the point of placement when the concrete is pumped.

4. The submitted concrete mix design shall indicate that the mix is designed to be pumped. Once mix designs are approved, changes in the mix to accommodate pumping shall be prohibited unless new mix designs are submitted for approval.

N. Surface moisture evaporation rate of exposed concrete surfaces during placement and prior to implementation of moist curing measures shall be maintained below levels described herein. Use equipment and determine evaporation rate of exposed concrete surfaces in accordance with ACI 305.1.

3.6 COLD WEATHER PLACEMENT:

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
4. Do not place concrete when temperature is 40^{o}F and falling, and when freezing weather is predicted within 24 hours unless protective measures are in place to provide adequate curing environment as outlined below
5. High early strength (Type III) cement shall not be used.

B. Thaw subgrades to six inches prior to placement. Demonstrate that subgrade is thawed with calibrated thermometer. All materials in contact with fresh concrete shall be above freezing at the time of placement unless otherwise permitted.

C. In addition to laboratory cured test specimens, additional concrete test specimens shall be cured under field conditions as required and directed by the Engineer to check the adequacy of curing and protection of the concrete.

D. Adequate equipment shall be provided for heating the concrete material and protecting the concrete during the cold weather length of protection shall be that time specified for curing. Maintain a minimum placement temperature and protection temperature surrounding the concrete during the entire curing period as specified in ACI 306.1. Record temperature once every 6 hours to demonstrate compliance.

E. Slabs and other members are to be covered with insulated blankets or other suitable protection method per ACI 308.1. Supplement with external heating as required. Provide tented, heated areas surrounding concrete walls. Heaters which exhaust gases that contain carbons are not allowed except that indirect-fired heaters (that exhaust outside the enclosure) shall be permitted. Ensure that heat is spread evenly. Do not overheat individual areas or create excessive thermal gradients.

3.7 HOT WEATHER PLACEMENT:

A. Hot-Weather Placement: Comply with ACI 301 and protect all concrete work from physical damage or reduced strength which could be caused by high ambient temperature, solar radiation, low humidity, or wind in compliance.

1. Maintain concrete temperature below 80 ^{o}F at time of placement unless otherwise permitted. Chilled mixing water or chipped ice may be used to control temperature,

provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas. Keep forms and areas in contact with concrete continuously moist during curing.

B. Cool reinforcing by wetting sufficiently so that the steel temperature will not exceed the ambient air temperature immediately before placing concrete. Use an approved admixture designed to retard the rate of set as necessary. Admixtures shall be tested in the design mix prior to use. Admixtures shall not contain any chlorides.

C. Prompt curing shall be exercised. The use of evaporation retarders is prohibited unless otherwise permitted by the Engineer. Fogging used prior to application of final moist curing measurers shall be done with an atomizing fogger; all exposed surfaces must be continuously fogged, and surfaces must not be allowed to dry.

D. The concrete supplier shall make provision for cooling concrete materials as necessary to meet specifications. Aggregates shall be uniformly moistened in stockpiles.

3.8 FINISHING FORMED SURFACES:

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces where indicated and not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces where indicated and/or to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, painting or other similar system.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces, perform necessary patching and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one-part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one-part portland cement and one-part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Form-Liner Finish: Produce a textured surface free of pockets, streaks, and honeycombs, and of uniform appearance, color, and texture.

E. Exposed Aggregate Finish:
   1. High-Pressure Water-Jet Finish: Perform high-pressure water jetting on concrete that has achieved a minimum compressive strength of 4500 psi (31 MPa). Coordinate with formwork removal to ensure that surfaces to be high-pressure water-jet finished are treated at same age for uniform results.
      a. Surface Continuity: Perform high-pressure water-jet finishing in as continuous an operation as possible, maintaining continuity of finish on each surface or area of Work. Maintain required patterns or variances in reveal projection to match the cleaned existing exposed aggregate concrete.

   2. Abrasive-Blast Finish: Perform abrasive blasting after compressive strength of concrete exceeds 2000 psi (13.8 MPa). Coordinate with formwork removal to ensure that surfaces to be abrasive blasted are treated at same age for uniform results.
      a. Surface Continuity: Perform abrasive-blast finishing in as continuous an operation as possible, maintaining continuity of finish on each surface or area of Work. Maintain required patterns or variances in depths of blast to match design reference sample or mockup.
      b. Abrasive Blasting: Abrasive blast corners and edges of patterns carefully, using backup boards, to maintain uniform corner or edge line. Determine type of nozzle, nozzle pressure, and blasting techniques required to match design reference sample or mockup.
      c. Depth of Cut: Use an abrasive grit of proper type and gradation to expose aggregate and surrounding matrix surfaces to match the cleaned existing exposed aggregate concrete., as follows:
      d. Medium: Generally, expose coarse aggregate; with slight reveal, a maximum of 1/4 inch (6 mm).

F. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS:

A. General: Use industry accepted techniques for screeding, restraightening and finishing operations to comply with the requirements of these ACI 301 and these specifications. Guidance can be found in ACI 302.1R. Do not wet concrete surfaces. Do not overwork surfaces. Do not segregate concrete from overworking. Coordinate all concrete finishes with the Engineer and final finished surface manufacturer prior to implementation.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.

   1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings and/or to receive mortar setting beds for bonded cementitious floor finish, as required by the manufacturer or as indicated.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Floating shall begin when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation. During or after the first floating, the plane of surfaces shall be checked with a left straight edge applied at not less than two different angles. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated to receive trowel finish and/or to be covered with fluid-applied or sheet waterproofing.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings and finish replaced areas to blend with adjacent concrete.

1. Apply a trowel finish to surfaces exposed to view, to be covered with resilient flooring, linoleum, carpet, ceramic or quarry tile set over cleavage membrane, paint or another thin-film finish coating system, as required by the manufacturer, or as indicated.

2. For floor installations greater than 10,000 ft^2, finish surfaces to the following tolerances, according to ACI 117 and ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface except as noted herein:
   a. Specified overall flatness F_F $(SOF)_F$ and levelness F_L $(SOF)_L$ with minimum values equal to 2/3 of the specified values, required for application of the specific coating or overlay to be coordinated with the specific trade.
   b. Moderately Flat as described in ACI 117 for exposed areas with minimum values equal to 2/3 of the specified values.
   c. Contractor shall be responsible for meeting or exceeding flatness and levelness requirements. Any slabs which do not meet these requirements are subject to removal and replacement at the Owner's discretion at no additional cost to the Owner.

3. For floor installations 10,000 ft^2 or less and incidental areas, finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.-(3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch (6 mm).

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or quarry tile is to be installed by either thickset or thin-set method or where indicated. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances and methods for trowel finished floor surfaces.

F. Broom Finish: Apply a non-slip broom finish as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

G. Slip-Resistive Finish: Apply Slip-Resistive Finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated. Before final floating, apply slip-resistive aggregate or aluminum granule finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions as indicated or directed and as follows:

1. Uniformly spread as indicated and not less than 25 lb/100 sq. ft. of dampened slip-resistive aggregate granules over surface in 1 or 2 applications. Tamp aggregate flush with surface, but do not force below surface.
2. After broadcasting and tamping, apply float finish.
3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate granules.

H. Curing: Wet cure for a period of seven days, minimum. Refer to other sections of specs.

I. Control Joints: Saw-cut slabs as soon as possible after finishing using a saw blade that has a triangular arbor configuration to reduce edge raveling or dislodging aggregates at the following spacing to minimize slab curling and cracking. Refer to plans for control joint layout. Fill joints in accordance with Architectural drawings.

J. Finishing: Refer to the Architectural drawings and specifications for finishes. The finished concrete slab shall comply with the damage and stain prevention provisions specified in the diamond polishing concrete floors specification.

3.10 MISCELLANEOUS CONCRETE ITEMS:

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

E. Concrete in earth: Where trench excavation is used, and where sides of excavations are cut neatly in good, firm soil, side-forms may be omitted.

3.11 CONCRETE PROTECTING AND CURING:

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection, and ACI 301 and ACI 305.1 for hot-weather or high evaporation protection during curing.

B. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

C. Unformed Surfaces: Begin curing immediately (within 10 minutes) after finishing concrete or when the surface is firm enough to resist marring. Implement fogging between finishing and application of final moist curing if final moist curing is delayed or evaporative conditions exist. Do not allow concrete to dry at any period after placement and during the curing period. Cure unformed surfaces including floors and slabs, concrete floor toppings, and other surfaces. Carefully apply curing measures so that surfaces are not marred.

D. Moist cure concrete according to ACI 308.1, unless otherwise permitted or required. Record daily high and low temperatures adjacent to the concrete. Standard curing shall be seven-day moist cure except as approved otherwise:

1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Clean absorptive cover, water saturated, and kept continuously wet. Cover shall be clean and premoistened with clean water for a period of at least 24 hours prior to placement but shall be kept dry when not in use. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers. A moisture retaining cover (as described below), fogger, soaker hoses and/or sprinkler shall be used to maintain moist conditions. Method must be approved and demonstrated to provide continuously moist conditions. Practice cold and hot-weather concrete procedures per ACI 306.1, ACI 305.1 and ACI 301, as necessary. Water shall not be more than 20 ^{o}F cooler or warmer than the concrete. At slabs on grade prevent curing water from entering construction and control joints.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape. Moisture-retaining cover is to be used with absorptive cover above, unless permitted by the Engineer.

3. Curing and Sealing Compounds: Use of curing compounds is prohibited unless permitted by the Engineer and approved by coating or floor covering manufacturer and installer in writing if applicable. Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Maintain continuity of coating and repair damage during curing period.

    a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. During the curing period, protect concrete from damaging mechanical disturbances including load stresses, shocks, excessive vibration, excessive thermal gradients, and from change caused by subsequent construction operations. Sequence placements such that influence from loading of adjacent spans does not create excessive bendings stresses and cracking.

E. Architectural and Exposed Concrete:

1. Repair and cure damaged finished surfaces of cast-in-place architectural concrete when approved by Architect. Match repairs to color, texture, and uniformity of surrounding surfaces and to repairs on approved mockups.
2. Remove and replace cast-in-place architectural concrete that cannot be repaired and cured to Architect's approval.
3. Protect corners, edges, and surfaces of cast-in-place architectural concrete from damage; use guards and barricades.
4. Protect cast-in-place architectural concrete from staining, laitance, and contamination during remainder of construction period.
5. Clean cast-in-place architectural concrete surfaces after finish treatment to remove stains, markings, dust, and debris.
6. Wash and rinse surfaces according to concrete finish applicator's written instructions. Protect other Work from staining or damage due to cleaning operations.
7. Do not use cleaning materials or processes that could change the appearance of cast-in-place architectural concrete finishes.

3.12 JOINT FILLING:

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling with semi-rigid sealants until concrete has aged at least six month(s), and preferably one year. Do not fill joints until construction traffic has permanently ceased.
2. Defer joint filling with flexible sealants for 60 days or as late as possible prior to installing floor finishes.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semi-rigid joint filler full depth in saw-cut joints and at least 1 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

D. Install flexible joint filler at least 1/2 inches deep in saw-cut joints and full depth in formed joints. Tool surface to provide full contact of sealant on sides of joint.

3.13 CONCRETE SURFACE REPAIRS:

A. Complete repairs at defective areas as described herein unless otherwise directed. Inform Engineer of all patching and repairs. Submit material data sheets and procedures for repair for approval prior to implementing repairs.

B. Defective Concrete: Repair and patch defective areas as directed by and with approval of the Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval. If repair is not acceptable to the Architect, remove and replace defective concrete. Replace stained concrete that cannot be cleaned.

C. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing, or use compatible prepackaged material, as required or approved. Patching materials shall be compatible with adjacent concrete and meet strength and durability requirements of this specification. Bonding agents shall be as indicated in ACI 301 or as approved by the Engineer. Use materials appropriate for specific type of repair. If commercial bonding agents and/or pre-packaged materials are approved, bonding agent and repair must be applied in strict accordance with manufacturer’s requirements. All repair materials are subject to approval by the Engineer and Architect.

D. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Repairs and materials shall be per ACI 301 and shall be completed immediately upon form removal, except that minimum repair depth is 1 inch.
1. Patch test areas at inconspicuous locations to verify mixture and color match before proceeding with patching.
2. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.

E. Repairing Unformed Surfaces: Repair surfaces in accordance with ACI 301. Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01-inch-wide or that

penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions. Finish repaired areas to blend into adjacent concrete.

2. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate or use approved compatible pre-packaged materials, as required. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

3. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

F. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.

G. Repair materials and installation not specified above may be used, subject to Engineer's approval.

H. Fill in holes and openings left in concrete structures for the passage work by other trades, unless otherwise shown or directed, after the work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in place construction. Provide all other miscellaneous concrete filling shown or required to complete work.

I. Concrete work which does not conform to the specified requirements, including strength, tolerances, and finishes, shall be corrected as directed by the Engineer, at the Contractor's expense, without extension of time therefore. The Contractor shall also be responsible for the cost of corrections to any other work affected by, or resulting from, correction to the concrete work.

3.14 TESTING AND FIELD QUALITY ASSURANCE:

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

2. Testing Frequency: Obtain at least one composite sample for each 100-cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.

6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

7. Compression Test Specimens: ASTM C 31/C 31M.
    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

10. Cost for additional sets of lab or field cured compressive strength cylinders required by the contractor as back-up to demonstrate conformance or for form removal or other construction operations shall be incurred by the contractor.

11. Strength of each concrete mixture will be satisfactory if every average of any three-consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

12. Test results shall be reported in writing to Architect, concrete manufacturer, Engineer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall

contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

13. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

14. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.

15. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

16. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.15 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

3.16 WORKMANSHIP

A. Concrete work which does not conform to the specified requirements, including strength, tolerances, and finishes, shall be corrected as directed by the Engineer, at the Contractor's expense, without extension of time therefore. The Contractor shall also be responsible for the cost of corrections to any other work affected by, or resulting from, correction to the concrete work.

END OF SECTION 03 30 00

SECTION 04 06 00
MASONRY MORTAR

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Fine and course grout for block fill (Section 03 30 00)
2. Unit masonry (Section 04 20 00).

B. Work Included This Section:

1. Mortar for masonry work and related work listed above and other work requiring the use of mortar.
2. All accessory materials and labor required for proper preparation and installation of mortar.

C. Mortar Requirements Specified Elsewhere: Mortar requirements specified in this Section apply generally to other Sections which require the use of mortar. However, mortar requirements included in other Sections shall take precedence over (for work of that particular section) any conflicting requirements of this Section.

1.3 INDUSTRY STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

American Concrete Institute (ACI)
American Society of Civil Engineers (ASCE)
The American Society for Testing and Materials (ASTM)

1.4 SUBMITTALS:

A. Manufacturer's Data:

1. Submit manufacturer's printed test reports on premixed masonry/ mortar cement. Tests shall have been performed and reports prepared by an independent testing laboratory.

2. Submit manufacturer's printed technical data and mixing data for premixed masonry/ mortar cements.

3. Submit certification that the masonry/ mortar cements meet the specified requirements of ASTM C 91 or ASTM C1329.

4. Submit certification that masonry/ mortar cement meets compressive strength requirements of ASTM C270.

1.5 PRODUCT HANDLING:

A. Delivery:

1. Materials shall be delivered to the Project Site in manufacturer's original, unopened containers with manufacturer's brand name clearly marked thereon.

2. Containers shall show formulation of the mixture.

B. Storage: Store materials under cover in a dry place. Cement, lime and air-setting mortars shall be stored in watertight sheds with elevated floors. Protect cement from dampness to minimize warehouse set.

C. Aggregate: Stockpile in a manner that will prevent segregation of sizes and the inclusion of dirt and other foreign material.

1.6 QUALITY ASSURANCE:

A. Comply with ACI 530.1/ASCE 6 "Specifications for Masonry Structures" and requirements herein. In case of contradiction, the more stringent requirement shall govern.
See Section 04 20 00 for additional requirements.

B. Hot and Cold-Weather Masonry Procedures: See Section 04 20 00.

C. Sand:

1. A representative sample of the job sand may be obtained and tested by an independent testing laboratory employed and paid for by the Owner.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Subject to compliance with the Drawings and Specifications, provide products by one of the following manufacturers, or equal approved in writing by the Architect:

Lafarge
Essroc Cement Company
Holcim Inc.
Lehigh Cement Company
Roanoke Cement Company

B. Source: Products for use on this Project shall be of one manufacturer unless noted specifically otherwise.

2.2 MATERIALS:

A. Prepackaged Materials:

1. Cement shall be Portland Cement, Type I or II, meeting Standard Specifications for Portland Cement (ASTM C-150).

2. Hydrated Lime shall meet the requirements of the Standard Specification for Hydrated Lime for Masonry Purposes (ASTM C-207), Type S.

3. Hydraulic Hydrated Lime shall meet the requirements of the Standard Specification for Hydraulic Hydrated Lime for Structural Purposes (ASTM C-141).

4. Air Entraining Admixtures may be utilized and shall conform to ASTM C-260.

5. Accelerating Admixture:

(a) Do not use any accelerating admixture without written approval of the Architect. The use of antifreeze is strictly prohibited in all cases.

(b) In order for a proposed accelerating admixture to be considered by the Architect it shall comply with the following requirements:

Shall contain no calcium chloride or added chloride ions.

Shall be non-corrosive to ferrous metal.

Shall not decrease compressive strength or bond strength of the mortar.

Shall not cause efflorescence.

Shall comply with ASTM C 494, Type E.

(c) Contractor shall submit with his accelerating admixture proposal a detailed description of the cold weather procedures regarding mixing and placing of mortar and protection of installed masonry that will be employed if the proposed accelerating admixture is used. These cold weather procedures shall be in accordance with the written instructions of the accelerating admixture manufacturer and shall be approved in writing by the Architect before the accelerating admixture can be used.

(d) Accelguard 80 Mortar Accelerator by The Euclid Chemical Company, Morseled by WR Grace, and Trimix-NCA by Sonneborn are acceptable products provided that it is approved by the Architect on a Project by Project basis and is used in accordance with the manufacturer's written instructions and provided that cold weather procedures approved by the Architect are employed.

B. Sand shall meet the requirements of Standard Specifications for Aggregate for Masonry Mortar (ASTM C-144).

C. Water shall be potable.

2.3 PREPACKAGED MASONRY/ MORTAR CEMENTS: The masonry/ mortar cement to be used on the Project shall be in accordance with ASTM C91 or ASTM 1329 and meet the following minimum requirements.

A. Type S Mortar: The mortar made from the masonry/ mortar cement shall have a compressive strength of 1800 psi minimum at 28 days when tested in accordance with ASTM C-270, with maximum air volume of 16% and shall comply with all requirements of ASTM C 270 for Type S mortar.

B. Type N Mortar: The mortar made from the masonry/ mortar cement shall have a compressive strength of 750 psi minimum at 28 days when tested in accordance with ASTM C-270 with maximum air volume of 16% and shall comply with all requirements of ASTM C 270 for Type N mortar.

C. Instructions for mixing the mortar made from masonry/ mortar cement shall be published and accompany all shipments. The instructions shall be volumetric measurements and shall be developed to show proper proportions of sand to one (1) bag of the prepackaged masonry/ mortar cement with volume of water to produce a flow of the proper consistency.

D. Freeze-thaw resistance: The mortar shall comply with the following requirements when subjected to 50 cycles of the freeze-thaw test:

Loss of compressive strength	-	35% maximum
Loss in dry weight	-	1.0% maximum

The test specimen shall be made and tested in accordance with ASTM C 91 or ASTM 1329.

2.4 MEASUREMENT AND MIXING:

A. The method of measuring materials shall be by volume and shall be such that the specified proportions of the mortar materials can be controlled and accurately maintained. A o measuring device to make consistent volume measurements shall be used throughout the project. Measurement of sand by shovel shall not be permitted.

B. Mortar Mixer shall be a paddle-type mechanical mixer. It shall be of such design and size to accommodate the mix without overloading and be adequately powered to vigorously mix the ingredients.

C. The mortar mixer shall be charged in this order: add approximately one-half the water required, one-half the sand, the prepackaged masonry/ mortar cement, the remaining amount of sand, and then sufficient water to bring the mix to desired consistency. Mortar shall be mixed for a minimum of five minutes after all materials have been charged into the mixer with all batches being mixed to the same consistency.

d. After mortar has been placed on the mortar board it shall be retempered by adding water only one time prior to placing. After retempering one time, if the mortar becomes too stiff it shall be discarded. Mortar shall be used and placed in its final position within 1-1/2 hours after mixing. Mortar not used within 1-1/2 hours shall be discarded.

E. Admixtures:

1. Do not use any admixtures, including, air-entraining agents, accelerators, retarders, water repellent agents, anti-freeze compounds, or other admixtures, unless expressly specified in this Section of the Specifications and approved by the Architect or Engineer.

PART 3: EXECUTION

3.1 LOCATION:

A. The Contractor shall have the option of using Type S mortar at all locations if he so chooses rather than Type S and Type N at the specified locations.

1. Type S Mortar: Below grade and for structurally reinforced or load bearing masonry.

2. Type N Mortar: Above grade except where Type S is specified.

3. Fine Grout: Use in spaces less than 2” wide. See Section 03 30 00.

4. Coarse Grout: Use in spaces 2" or more wide. See Section 03 30 00.

3.2 INSTALLATION:

A. Install as specified under Section 04 20 00 - Unit Masonry and other Sections of the Specifications.

END OF SECTION 04 06 00

SECTION 04 20 00
UNIT MASONRY

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Masonry mortar (Section 04 06 00).
2. Rigid board insulation (Section 07 20 00).
3. Sealant work (Section 07 90 00).

B. Work Included This Section: Masonry work as shown on Drawings and as specified herein including all supplementary materials and accessories required for complete and proper installation of the work.

1.3 INDUSTRY STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

American Concrete Institute (ACI)
American Society of Civil Engineers (ASCE)
The American Society for Testing and Materials (ASTM)
Brick Industry Association (BIA)
National Concrete Masonry Association (NCMA)

1.4 SUBMITTALS:

A. Submit certification specified hereinafter for concrete masonry units.

B. Submit certification by a nationally recognized testing lab that the brick to be provided complies with ASTM C 216 for the grade and type specified.

C. Masonry Cleaning Submittal: If high pressure water or sandblasting is proposed to be used to clean masonry, the Contractor shall submit written approval and recommended procedures for such method from the masonry manufacturer. The recommended procedure shall be specific regarding types of nozzles allowed, spray velocity, sandblasting grit allowed, and other factors that relate to the resulting change in appearance or other characteristics of the masonry as a result of the cleaning. Do not begin cleaning of masonry using high pressure water or sandblasting prior to approval of this submittal by the Architect. See Paragraph titled "High Pressure Water and Sandblasting" in Part 3 of this Section for additional requirements.

D. Procedures for Hot and Cold Weather Masonry Construction: Prior to installing any masonry during extreme hot or cold temperatures, the Contractor shall submit his proposed hot and cold weather masonry procedures to the Architect and shall have received the Architect's approval in writing of the procedures. Do not install any masonry during extreme hot or cold weather prior to written approval of these procedures by the Architect. See Paragraph "Environmental Conditions" in this Section for additional requirements regarding hot and cold weather masonry construction.

1.6 PRE-INSTALLATION MASONRY MEETING:

A. Prior to installation of any masonry work, the Contractor, Masonry Subcontractor, Architect, Owner and other involved subcontractors and material manufacturers or suppliers shall meet at the site. The Contractor shall schedule and conduct the meeting and shall give the Architect at least one-week notice of the meeting date and time.

B. The purpose of the meeting will be to verify that all requirements of the Contract Documents will be complied with and that the facility is ready and in proper condition to receive the masonry work.

C. No masonry work is to be installed until it is assured that the work will be installed in accordance with the Contract Documents.

1.7 PRODUCT HANDLING:

A. Storage of Materials:

1. Masonry Units: Stack masonry units at site and avoid chipping. Protect masonry units from freezing and thawing. Keep masonry units covered to prevent soaking by rain.

2. Protect masonry units from wetting, staining, soiling and physical damage.

3. Reinforcement: Provide cover for reinforcement prior to use. Remove any loose rust, scale, dirt or other coatings that will reduce the bond by wire brushing prior to placement.

4. Prepackaged masonry cements shall be delivered to the site and stored in unbroken bags or other approved containers. These materials shall be stored in dry, weather-tight sheds or enclosures with elevated floors, which will prevent the inclusion of foreign materials and damage by water or dampness. Masonry sand shall be delivered and stored in a manner to prevent inclusion of foreign material therein. Block shall be delivered and stored on the job site on platforms or timbers, clear of the ground. Blocks which are chipped, cracked, broken, or marred in any other manner shall not be used where exposed to view.

1.8 ENVIRONMENTAL CONDITIONS:

A. Contractor’s hot and cold weather procedures shall comply with ACI 530.1

1.9 PROTECTION:

A. Protect work against damage and keep top of walls covered with non-staining waterproof coverings when work is not in progress. Protect exterior masonry walls by covering walls up to a height of 30" above ground with 4 mil thick polyethylene or other suitable material.

1.10 QUALITY ASSURANCE:

a. Unless specifically shown otherwise on the Drawings or specified otherwise herein, all masonry work shall be installed in strict accordance with the printed instructions the National Concrete Masonry Association's printed instructions for concrete masonry work. Copies are available from the referenced agencies.

B. Unit Masonry Standard: Comply with ACI 530.1/ASCE 6 "Specifications for Masonry Structures."

C. Inspecting Laboratory Qualifications: To qualify for employment in performing tests and inspection specified in this Section, an independent laboratory must demonstrate to Architect's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM C 1093, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying the progress of the work.

D. Preconstruction Testing: Owner will employ and pay an independent testing laboratory to perform the following preconstruction testing indicated as well as other inspection and testing services required by referenced unit masonry standard or indicated for source and field quality control:

1. Concrete Masonry unit Tests: For each different concrete masonry unit indicated, units will be tested for strength, absorption, and moisture content per ASTM C 140.

2. Prism Tests: For each type of wall construction indicated, masonry prisms will be tested per ASTM C1314.

3. Mortar properties will be tested per property specifications of ASTM C 270.

4. Mortar composition and properties will be evaluated per ASTM C 780.

5. Grout compressive strength will be tested per ASTM C 1019.

E. Field Testing: As specified in Part 3 - Execution of this Section,

F. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined per ASTM E 119 by a testing and inspection organization, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

G. Single Source Responsibility of Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.

PART 2: PRODUCTS

2.1 MATERIALS:

A. Regular Concrete Masonry Units:

1. Contractor shall submit test reports by an independent testing laboratory, certifying that the block to be provided complies with all requirements of ACI 216 for the fire resistance ratings noted on the Drawings or specified in this Project Manual.

2. Contractor shall submit certification from an independent testing laboratory that the block to be provided meets the weight requirements specified hereinafter in this Section and conforms in all respects to ASTM C 90.

3. No visible moisture shall be present in the unit and linear shrinkage does not exceed 0.065% when the unit is oven dried.

4. Units shall be 2 cells except where other shapes or solid masonry units are called for. Provide special shapes as shown on Drawings or required by construction conditions.

5. Light-weight aggregate shall be expanded clay, slate or shale produced by rotary kiln process and shall comply with ASTM C 331. No cinders, bottom ash or other materials that could cause staining or pop outs shall be allowed. Normal-weight fine aggregate shall be manufactured fines such as granite screenings and shall comply with ASTM C 33. Natural sand will not be allowed. Provided that the block can meet all requirements specified herein, (including certified fire ratings and weight requirements) blending of normal-weight fine aggregate will be permitted to a maximum of 20% of the block weight. See certification submittal requirements specified in this Section.

6. Concrete masonry units shall be at least 10 days old when delivered to the job. Units shall have a minimum average compressive strength of 1900 psi and a minimum individual block compressive strength of 1700 psi, based upon average net area. Units shall have a maximum water absorption of not more than 18 lbs. per cu. ft. of concrete.

7. See Drawings for required fire ratings.

8. Air dry weights of units shall not exceed the following:

4 x 8 x 16 - 17 lbs.	4 x 8 x 16 - 75% Solid - 22 lbs.
6 x 8 x 16 - 20 lbs.	6 x 8 x 16 - 75% Solid - 29 lbs.
8 x 8 x 16 - 27 lbs.	8 x 8 x 16 - 75% Solid - 40 lbs.
12 x 8 x 16 - 39 lbs.	12 x 8 x 16 - 75% Solid -60 lbs.

9. Units shall be provided in sizes and thicknesses shown on the Drawings. Special sizes and shapes shall be provided as indicated on the Drawings and as required by construction conditions.

B. Horizontal Joint Reinforcement for CMU Walls (single wythe):

1. Type specified is as manufactured by Hohman & Barnards (H&B). Equal reinforcement manufactured by Dayton Sure Grip, Shore Company, Blok-Trus, Masonry Reinforcing Corporation (Wire-Bond) will be acceptable when approved by the Architect.

2. Joint reinforcement shall be 10' long sections of welded wire fabric, ladder or truss type. Reinforcement shall consist of 2 deformed longitudinal wires not lighter than 9 gauge and connected by cross wires not lighter than 9 gauges at intervals of not over 16", placed between longitudinal wires in the same plane. The width of the fabric shall be such as to engage the entire wall in which it is placed so that longitudinal wires will be located in the approximate center of the outer face shell mortar bed in hollow masonry units. Prefabricated corner and intersection pieces shall be of the same construction and fabric as the main fabric.

3. Provide prefabricated tees and corners.

4. Joint reinforcement shall be hot dip galvanized per ASTM A123.

C. Anchors for Miscellaneous Locations:

1. At locations shown on the Drawings or required by construction conditions, provide 345 BT Flexible Tie by H&B, or equal by Blok-Trus, Masonry Reinforcing Corporation (Wire-Bond).

2. Anchor to be of 12 gauges by 7/8" wide steel and tie to be of 3/16" diameter steel, both hot-dip galvanized.

3. Screws for attachment of anchor shall be self tapping NO. 10 x 1 1/4" with hex washer head and zinc plated. Do not use gypsum drywall screws.

D. Re-Bar Positioners: RB Positioners by H&B, or equal approved in writing by the Architect, fabricated from 9 gauge hot-dip galvanized wire and made to order to fit the specified or indicated masonry units and steel sizes.

E. Shelf Angles:

1. Shelf angles for brick veneer shall be steel angle, unless shown otherwise on the Drawings, conforming to ASTM A 36 and galvanized in accordance with ASTM A 123.

F. Steel Rebars for Concrete Filled Masonry Units: See Structural Drawings.

G. Masonry Cleaner: Sure-Klean 600, Vanatrol, Superior 800, Saf-D-Limer by Lester Laboratories, or approved equal. Cleaners shall be composed of detergents, wetting agents, buffering agents, and a maximum of 10% muriatic acid.

H. Control Joint: Manufactured of polyvinyl chloride compound conforming to ASTM D 2287, Type PVC 654-4 with a durometer hardness of 80 when tested in accordance with ASTM D 2240, D/A 2002, 2-1/8" width, by H&B or approved equal. See Section 07 90 00 for sealant materials required to caulk and seal the joint.

PART 3: EXECUTION

3.1 LAYING MASONRY:

A. Cutting of Units: Where cutting is necessary, make all cuts with a motor-driven masonry saw. Units with chips or irregular cuts will not be accepted. Should the Contractor observe variances in the color or texture of the approved decorative CMU or facing brick during installation, he shall immediately stop work and notify the Architect. Failure to follow this procedure may necessitate the removal of individual defective units or entire areas at the Contractor's expense.

B. Coursing: Masonry work is laid out on a nominal 3/8" uniformly wide joint. Work shall course vertically out as follows:

1. Concrete Masonry Units: 2 courses in 1'-4".

C. Lay masonry tight to interior door frames. Provide 1/4" to 3/8" space at jambs of exterior door frames to receive sealant.

D. Laying Concrete Masonry Units:

1. Unless shown specifically otherwise on Drawings, lay concrete block in regular running bond.

2. Use stretcher block in a running wall. Use square end block only at control/expansion joints, openings in the wall, and other conditions that specifically require a square end block. Do not mix stretcher and square end block in a running wall.

3. Lay out work so that no piece shorter than 4" will occur. Do not "tooth" abutting walls. Stack joint and rake out for caulking.

4. Lay concrete masonry units with face shells in mortar bedding, and with full head joints, plumb, level and true to line and properly jointed with other connecting work. Units with broken cells in wall will not be permitted. Make joints uniform, approximately 3/8" wide and cut flush. Exposed face joints shall be finished with metal tool to form a concave joint and to close hair line cracks and crevices.

5. Where concrete masonry units are to receive plaster, tile or cementitious coatings, provide flush struck joints on face to receive finish.

E. Laying Reinforced Masonry:

1. Position reinforcement accurately, either horizontally or vertically, as shown on the Drawings. Secure rigidly against displacement. Horizontal reinforcement shall be placed as concrete is placed. Splices in adjacent horizontal bars shall be staggered.

2. In space containing reinforcement, except small rods or mesh 1/4" or less in diameter, the clear distance between any masonry and reinforcement shall be not less than 1/4".

3. Use forms, as necessary, to prevent displacement of faces of wall. Do not remove forms or shores until masonry has hardened sufficiently to sustain dead and temporary live loads.

F. Masonry Joint Reinforcement:

1. See Drawings for details of reinforcement.

2. In addition to specific requirements, place masonry horizontal joint reinforcement in every other bed joint of concrete block construction. Lap reinforcement 8" at splices and ensure that wires are side by side and not one over the other. Use factory fabricated corners and tees. Use preformed tees or reinforcement at abutting walls; do not "tooth" interior intersecting partitions.

3. Build in wire anchor retainers to columns at proper spacing to engage anchor slots.

G. Tops of Walls:

1. Unless otherwise detailed on the Drawings, where CMU walls are extended to the underside of the building structure above, the wall shall be held down approximately 1" from the structure to allow for deflection of the structure. The space shall be filled with batt insulation specified in Section 07 21 10 for non-fire-rated walls and fire stopping specified in Section 07 84 00 for fire-rated walls and sealed as specified or shown for the particular wall type.

3.2 CONSTRUCTION TOLERANCES:

A. Variation from Plumb: For vertical lines and surfaces of columns, walls and arrises do not exceed 1/4" in 10', or 3/8" in a story height not to exceed 20', nor 1/2" in 40' or more. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story or 20' maximum, nor 1/2" in 40' or more. For vertical alignment of head joints do not exceed plus or minus 1/4" in 10', 1/2" maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4" in any bay of 20' maximum, nor 1/2" in 40' or more. For top surface of bearing walls do not exceed 1/8" between adjacent floor elements in 10' or 1/16" within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls and partitions, do not exceed 1/2" in any bay of 20' maximum, nor 3/4" in 40' or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4" nor plus 1/2".

E. Variation in Mortar Joint Thickness: Do not exceed bed joint thickness indicated by more than plus or minus 1/8", with a maximum thickness limited to 1/2". Do not exceed head joint thickness indicated by more than plus or minus 1/8".

3.3 BUILT-IN WORK:

a. Consult other trades in advance and make provisions for installation of their work in order to avoid cutting and patching. Build in work specified under other Sections of the Specifications as the work progresses.

B. Set lintels in beds of mortar.

3.4 POINTING OF MASONRY:

A. At the completion of the masonry work, all holes in the exposed masonry shall be pointed. Defective joints shall be cut out and tuckpointed solidly with mortar. Pointing and tuckpointing shall be done with a pre-hydrated mortar. The mortar cement shall be controlled so that after curing of the mortar, no unacceptable difference in texture or color exists with that of adjacent masonry.

3.5 FIELD TESTING:

A. The following testing will be performed by a testing laboratory employed and paid by the Owner and is applicable to reinforced structural walls and load bearing walls only and is not applicable to non-load bearing and unreinforced walls and masonry veneer.

1. Testing Frequency: Tests and evaluations listed in this article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof.

(a) Mortar composition and properties will be evaluated per ASTM C 780.

(b) Grout compressive strength will be sampled and tested per ASTM C 1019.

2. Prism Test Method: For each type of wall construction indicated, masonry prisms will be tested per ASTM C1314.

(a) Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.

3. Evaluation of Quality Control Tests: In absence of other indications of noncompliance with requirements, masonry will be considered satisfactory if results from construction quality control tests comply with minimum requirements indicated.

3.6 MASONRY CLEANING:

A. While laying the masonry, good workmanship and job housekeeping practices shall be used so as to minimize the need for cleaning the masonry. Protect the base of the wall from mud splashes and mortar droppings, protect the wall by setting scaffolds so that mortar is not deflected onto the wall.

B. The laying technique shall be such that mortar does not run down the face of the wall or smear the mortar onto the masonry face. For split-face masonry, let mortar take some set to reduce water before cutting with trowel.

C. After the joints are tooled, cut off mortar tailings with the trowel and brush excess mortar burrs and dust from the face of masonry. Do not bag or sack the wall but use a masonry brush made with medium soft hair.

D. Remove all large mortar particles with a hardwood scraper.

E. If after using the above outlined techniques, additional cleaning of the walls is found necessary, allow the walls to cure one month prior to initiating further cleaning processes.

F. Saturate the wall with clean water. The wall shall be thoroughly saturated prior to and at the time the cleaning solution is applied.

G. Clean the wall only with an approved cleaning solution applied with a brush, starting at the top of the wall. Approved cleaning solutions are as follows: Sure-Klean 600, Vanatrol, Superior 800, or approved equal. Approved cleaners shall be composed primarily of detergents, wetting agents, buffering agents, and a maximum of 10% muriatic acid. The use of any of the above cleaning agents shall first be approved in writing by the manufacturer of the masonry being cleaned, and the Designer. The concentration, method of application of the cleaning solution, and method of scraping shall be as outlined on the container by the manufacturer.

H. Immediately after cleaning a small area, the wall shall be rinsed thoroughly with large quantities of water.

I. Protect adjacent surfaces and materials during cleaning operations.

J. After the walls are cleaned, take necessary precautions to ensure that other contractors and subcontractors do not damage or soil the walls.

K. Do not use acid, steel wool or other abrasives to clean masonry. Use masonry detergent cleaner such as Vana-Trol or Deox.

3.8 HIGH PRESSURE WATER AND SANDBLASTING:

A. High pressure water and sandblasting shall not be used for cleaning except with the written recommendation of the masonry manufacturer, and the written approval of the Architect. See Paragraph "Submittals" included in Part 1 of this Section for the required masonry cleaning submittal if high pressure water or sandblasting is proposed to be used. Do not use high pressure water or sandblasting to clean masonry prior to approval of this submittal by the Architect.

B. If high pressure water or sandblasting is proposed to be used to clean masonry, the submittal referenced above must be submitted by the Contractor and approved by the Architect and then a sample cleaning area for each method of cleaning proposed and for each type of masonry to be cleaned shall be cleaned by the Contractor and approved by the Architect before beginning cleaning of masonry. The approved sample areas shall become standards for the cleaned masonry walls to match.

END OF SECTION 04 20 00

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 WORK INCLUDED IN THIS SECTION

A. Work of this section consists of furnishing, fabricating, delivering, and erecting structural steel complete as required by drawings.

B. Material furnished under this section shall include, but not be limited to the following:

1. Steel superstructure including column anchor bolts, column base plates, columns, beams, girders, bearing plates, connection plates, shear studs, angles, bracing, permanent field bolts, welding, and detail material required to complete the job.

2. Cleaning, preparation, priming, and field touch-up painting is included.

3. Anchors and other anchorage devices embedded in concrete and masonry as shown on the structural drawings and as specified herein.

4. Grout for column base plates and beam bearing plates.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Metal Decking (Section 05 30 00)
B. Metal Forms (Section 05 31 00)
C. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
D. Division 05 Section "Steel Decking" for field installation of shear connectors through deck.
E. Division 05 Section "Metal Fabrications".

1.4 QUALITY ASSURANCE

A. Reference Standards:

1. Some products and execution are specified in this section by reference to published specifications or standards of the following (with respective abbreviations used):

American Institute of Steel Construction (AISC)
The American Society for Testing and Materials (ASTM)
American Welding Society (AWS)
Steel Structures Painting Council (SSPC)

2. Standard References:

a. The current edition of the following references shall apply to work of this section. Suffixes indicating date of issue are omitted from reference numbers used in the text of this section.

b. Publications of AISC:

(1) "Code of Standard Practice for Steel Buildings and Bridges".

(2) "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings", including "Commentary", and supplements thereto.

(3) "Specifications for Structural Joints using ASTM A325 or A490 Bolts" approved by Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation (except high strength A490 bolts are to be tightened to a tension value of 28,000 pounds and A498 bolts to a tension value of 49,000 pounds in any connections other than bearing type connections.).

c. Publications of ASTM: ASTM A6 - "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".

d. Publications of AWS: AWS D1.1 - "Structural Welding Code".

3. Manufacturer's Specifications: Any material or operation specified by reference to published specification of a manufacturer shall comply with requirements of latest edition of standards listed herein. In case of conflict between reference specification and contract document, the contract documents shall govern.

B. Source Quality Control:

1. Materials and fabrication procedures shall be subject to inspection and tests in mill, shop, and at project. Test shall be conducted by a qualified inspection agency provided by Owner.

2. Such inspections and tests shall not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

3. Promptly remove and replace materials or fabricated components which do not comply with requirements of contract documents.

4. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated as AISC-Certified Erector, Category ACSE, CSE.

C. QUALIFICATIONS OF THE FABRICATOR: The Fabricator of all structural steel shall have the following qualifications:

1. The Fabricator shall have been in the steel fabrication business no less than 10 years and have successful prior experience as the principal structural steel fabricator on projects of similar design and complexity as this project.

2. The Fabricator shall submit upon request a list of at least three (3) projects which demonstrate sufficient prior experience. The list shall include project name, location, date, Owner's name, name and phone number of the Owner's Representative, and a description of the steel framing system.

3. The Fabricator shall have sufficient production capacity and quality control programs in place to meet the proposed project schedule with work which meets the requirements of the Contract Documents.

4. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

D. Qualification for Welding Work:

1. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

2. At Contractor's expense, provide certification to the Engineer that welders to be employed in the work have satisfactorily passed AWS qualification tests within the previous 12 months prior to the start of work.

3. If recertification of welders is required, retesting shall also be Contractor's responsibility.

4. Welders shall be able to produce certification cards at jobsite on demand.

E. Design Criteria for Members and Connections:

1. Details shown on drawings are generally typical. Similar details shall apply to similar conditions, unless indicated otherwise. Verify dimensions at the site without causing delay in work.

2. Promptly notify Engineer whenever design of members and connections for any portion of the structure are not indicated clearly.

3. Fabricator is to design any connections not specifically detailed on drawings. Submit design for Engineer's approval. Design shall be in accordance with latest AISC Specifications and the North Carolina State Building Code and shall support the design load. Connection designs shall include specifics including weld length, size, location, etc. and shall be clearly indicated on the shop drawings. Calculations for the design of connections shall be provided for standard connections for reference, for all atypical connections and at the request of the Engineer.

1.5 SUBMITTALS

A. Shop Drawings:

1. Submit shop drawings of all fabricated materials to be furnished and delivered to the site. Erection drawings to locate and identify members shall accompany shop drawings. Do not use copies of contract drawings to produce shop drawings.

2. Submit copies of each shop and erection drawing sheet of the shop drawings.

3. Show details and schedules for fabrication and shop assembly of members. Show details, schedules, procedures, and diagrams indicating sequence of erection. The sequence of erection must be coordinated with and take into consideration the event schedule of the facility as provided in the specifications.

4. Wherever possible, details and sections shown on shop drawings shall be identified by use of same marks used on contract drawings.

5. Show details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols; show size, length, and type of each weld.

6. Provide setting drawings, templates, and directions for the installation of anchor bolts and other anchorages to be installed by others.

7. Only complete shop drawings which are checked and stamped "Approved by Contractor" will be accepted for review.

B. Product Data and Manufacturer's Printed Installation Instructions: Submit (in triplicate) the following for review by Project Engineer:

1. Laboratory test reports or other data as required to show compliance with contract documents of the following:

a. Structural steel (each type), including certified copies of mill reports covering the chemical and physical properties for record only.

b. High-strength bolts (each type), including nuts and washers.

c. Unfinished bolts and nuts.

d. Welding electrodes

e. Grout for column base plates

f. Shear studs

2. Submit manufacturer's specifications and installation instructions of the following: Shop paint for structural steel.

3. Indicate by transmittal form that a copy of each applicable instruction has been distributed to fabricators, installers, and erectors.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel", for each welded joint whether prequalified or qualified for testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

D. Qualification Data: For qualified installer fabricator.

E. Welding Certificates.

1.6 DELIVERY, HANDLING, AND STORAGE

A. Deliver materials to site at such intervals as to ensure uninterrupted progress of work.

B. Store materials in an arrangement and manner that will permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from mud, corrosion, and deterioration.

C. Protect steel members stored on the job site from extended periods of exposure that might result in corrosion or deterioration. Dunnage, skids, etc. are to be used in shipping, storage, etc. Members are not to be placed in direct contact with the ground or moisture during any phase of storing and handling.

D. Store members on skids to prevent contact with the ground.

E. Store and handle steel members to prevent distortions that would result in damage to the members. Nylon slings for handling are required.

1.7 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturer's recommendations to ensure that shop primers and topcoats are compatible with one another. Coordinate steel surfaces to receive spray on fireproofing with spray on fireproofing manufacturer.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rolled Steel Plates, Shapes, and Bars: W-shapes and WT-shapes, ASTM A992, Fy=50 ksi. All other ASTM A36, Fy=50 ksi.

B. Rectangular and Square Cold-Formed Steel Tubing: ASTM A500, Grade B; Fy = 46 ksi.

C. Round Cold-Formed Steel Tubing: ASTM A500, Grade C; Fy = 46 ksi.

D. Steel Pipe: ASTM A53, Type E, Non-Tested, Grade B; Fy = 35 ksi.
1. Weight Class: Standard, Extra Strong, Double-Extra strong as indicated in drawings.
2. Finish: Black except where indicated to be galvanized

E. Anchor Bolts: ASTM A36.

F. High-Strength Threaded Fasteners: Heavy hexagon bolts, nuts, and hardened washers complying with ASTM A325 unless otherwise noted.

G. Electrodes for Welding: Comply with AWS Code, ASTM A233-E70 Series electrodes.

H. Unfinished Threaded Fasteners: ASTM A-307, Grade A, regular low carbon steel bolts and nuts.

I. Headed Stud Type Shear Connectors: ASTM A-108 Grade 1015 or 1020, cold finished carbon steel with dimensions complying with AISC Specifications.

J. Corrosion-Resisting Cold-Formed Hollow Structural Sections: ASTM A 847, structural tubing

K. Steel Castings: ASTM A 216, Grade WCB with supplementary requirement S11.

L. Steel Forgings: ASTM A668

M. Shop Coating System:

Shop Primer:

1. All unexposed steel shall receive a SSPC Paint 25, Type II, zinc oxide, alkyd, linseed oil primer.
   a. Surface Preparation: Clean surfaces to be primed/painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
      i. SSPC-SP 2, "Hand Tool Cleaning."
      ii. SSPC-SP 3, "Power Tool Cleaning."

b. Total dry film thickness shall be not less than 3.0 mils. Allow final coat to dry to thumbnail hardness before transporting. Paint within 10 hours of cleaning and before there is visible rust.

2. All exposed steel (Including Lintels) and structural-steel located outside the buildings thermal/moisture envelope, unless noted otherwise: Carbo Zinc #11 by Carboline or approved equal. Exception: Exposed steel with Hot-Dip Galvanized Finish (ASTM A 123, 1.5 oz/sq.ft min.) does not require primer.
   a. Surface preparation shall be SSPC SP6 or better. Immediately after surface preparation (within 10 hours of blasting and before there is visible rust),
   b. Apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 6.0 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

N. Nonmetallic: Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, non-corrosive and non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

O. Asphaltic type paint for application as noted herein (Field Painting, Section 3.03).

2.2 FABRICATION

A. Shop Fabrication and Assembly:

1. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

   a. Camber structural steel members where indicated.
   b. Fabricate beams with rolling camber up.
   c. Identify high-strength structural steel according to ASTM A6 and maintain markings until structural steel has been erected.
   d. Mark and match-mark materials for field assembly.
   e. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

2. Properly mark and match-mark materials for field assembly. Fabricate for delivery in sequence which will expedite erection, and which will minimize field handling of materials.

3. Members shall be free from twists, kinks, or open joints and shall be made that when assembled the parts shall come together without shimming.

B. Connections:

1. Weld or bolt shop connections, as indicated.

2. Bolt field connections, except where welded connections or other connections are indicated. Provide high-strength, threaded fasteners for all bolted connections.

C. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints" using ASTM A325 Bolts or A490, Type "N", unless otherwise noted on drawings. Provide high strength bolts for all connections except column anchor bolts. Tighten 3/4" diameter high strength bolts to 28,000 pounds tension in "slip critical" connections and braced frame connections. Bearing type connections shall be snug tight.

D. Welded Construction: Comply with AWS Code D1.1 for procedures, appearance, and quality of welds; and for methods used in correcting welding work.

1. Assemble and weld built-up sections by methods which will produce true alignment of axis without warp.

2. All surfaces of structural steel to which welds shall be applied shall be power tool cleaned for a minimum distance of two inches around the weld, removing all dust, oil, rust, or other substances which may inhibit weld fusion, leaving a clean, shiny, metal surface. Omit painting from surfaces to be welded.

3. Welds exposed to view in the completed structure shall be ground smooth.

E. Holes in Structural Steel:

1. Holes required for securing other work to structural steel framing will not be allowed.

2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

3. Under no circumstances shall holes or cuts be made in structural steel members in the field, unless specifically directed by the designer.

F. Measurements:

1. The dimensions and location of all members are indicated on the drawings, sections and details, all which are believed to be correctly shown; but the fabricator and Contractor shall verify by field measurements all dimensions and elevations for both new and existing construction prior to beginning detailing or fabrication of the structural steel.

2. The Contractor shall field verify dimensions and elevations and shall notify the Engineer and steel fabricator of any discrepancies from the plan dimensions and elevations prior to continuing with work.

G. Embedded Shapes: Steel angles, plates, and other steel shapes which are embedded in concrete in an exposed condition, including masonry lintels, shall be hot dip galvanized in accordance with ASTM A153 with a minimum coating weight of 1.50 oz./sq.ft.

H. Stud Connectors and Anchor Studs:

1. All studs shall be end welded with automatically timed stud welding equipment in accordance with manufacturer's recommendations.

2. When two or more stud welding guns are operated from the same power source, they shall be interlocked so that only one gun can be operated at a time, and so that the power source has fully recovered from making one weld before another weld is started.

3. The structural member receiving the stud shall not be painted prior to welding.

4. Surfaces to which studs are to be welded shall be free of rust, scale, or other injurious materials as required to obtain satisfactory welds.

5. Surfaces shall be dry.

6. Studs, after welding, shall be free from any defect or substance that would interfere with their intended function. If after welding visual inspection reveals that a sound weld or a full 360-degree fillet has not been obtained from a particular stud, stud is to be replaced. Studs at each end of each member shall be struck with a hammer and bent 15 degrees off perpendicular to the beam. Studs failing this test shall be replaced.

2.3 SHOP PAINTING

A. General Requirements for Shop Painting:

1. Do not paint surfaces which will be field welded, concrete encased, fireproofed, galvanized or are part of "slip critical" bolted connections.

2. Coordinate painting requirements with manufacturer of fireproofing material on all surfaces to receive fireproofing. Steel members to be fireproofed should not be primed or painted, unless otherwise noted by the fireproofing manufacturer.

3. Paint all other surfaces.

B. Surface Preparation:

1. After inspection, and before shop priming, clean steelwork to be painted. Remove loose rust, oil, grease, loose mill scale, and splatter, slag, flux deposits, etc.

2. Clean unexposed steel in accordance with SSPC Specification SP-2, "Hand Tool Cleaning". Clean exposed steel in compliance with SSPC- SP6, "Commercial Blast Cleaning". Provide radius on edges and corners of exposed steel.

3. All sharp and rough edges are to be ground round. Avoid oil deposits that would require solvent cleaning, blast and prime all contact surfaces before shop bolting or welding. Blast clean all shop bolting or welding. Blast clean all shop and field bolts and bolt heads. Painting equipment is to be kept clean. Avoid contamination of the coating system. Insure that entire surface receives at least the minimum coverage.

C. Painting:

1. Immediately after surface preparations, apply shop paint in accordance with manufacturer's printed instructions, and at a rate to provide a uniform dry-film thickness specified hereinbefore.

2. Use painting methods which will result in full coverage of joints, corners, edges, and all surfaces.

2.4 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123, 1.5 oz/sq.ft min..

1. Galvanize lintels, shelf angles, steel members exposed to the exterior or to corrosive environments, as shown on the drawings, and all other steel members attached to structural-steel frame located in exterior walls.
2. Fill vent holes and grind smooth after galvanizing.
3. Do NOT hot dip galvanize high strength bolts or rods, use alternative coating method with equivalent protection.

2.5 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 - EXECUTION

3.1 INSPECTION

A. Erector shall examine areas and conditions under which structural steel shall be installed.

B. Erector shall notify Engineer and Contractor (in writing) of conditions detrimental to proper and timely completion of the work.

C. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to erector.

3.2 ERECTION

A. Surveys: The Contractor shall use qualified personnel to lay out, locate and set correct elevations on all members. A registered surveyor is required for the layout of column anchor bolt settings. Field verification of all existing conditions shall be performed by the erector prior to installation of any work for comparison with the shop drawings, contract drawings and the existing conditions. Notify the Engineer immediately of any discrepancies that exist between the final locations and plan locations.

B. Field Assembly:

1. Set structural members accurately to lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Erection is to be in compliance with AISC, Code of Standard Practice for Steel buildings and Bridges, unless otherwise noted.

2. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly.

3. Perform necessary adjustments to compensate for discrepancies in elevations and alignment. Level and plumb individual members of the structure within specified AISC tolerances.

4. Splice members only where shown or specified. No splice or other connection welded or otherwise shall be made without having been detailed on shop drawings or permitted in writing by the Engineer.

5. On exposed welded construction, remove erection bolts, fill holes and plug welds, and grind smooth at exposed surfaces.

6. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

7. No permanent bolting or welding shall be done until structure has been properly aligned and plumbed.

8. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts with approval of Engineer.

9. Unless specifically identified on the Drawings, standard connections shall be designed as snug tight connections. Fasteners shall be tightened in properly aligned holes. When slip critical joints or pretensioned bolts are required, tighten bolts to the minimum tension specified. Tightening shall be by the turn of the nut procedure or other approved method. Provide hardened washers under all elements to be turned.

10. Gas Cutting:

    a. Do not use gas cutting torches in the field for correcting fabrication errors in structural framing.

    b. Finish gas-cut sections equal to a sheared appearance when permitted. This includes cutting with saws, grinding and touch up painting, as required to remove any rough edges, burrs, or other stress risers.

11. The erector shall establish permanent bench marks as shown and as necessary for the accurate erection of the structural steel. Check elevations of concrete and masonry bearing surfaces. The erector shall report measurement or elevation discrepancies to the Contractor. Do not proceed with erection until discrepancies have been corrected or until adjustments to the structural steel work have been agreed upon by the Engineer.

12. Temporary Shoring and Bracing: Provide temporary shoring and bracing members as required, with connections of sufficient strength to support imposed loads. Remove temporary members and connections when permanent members are in

place and final connections are made. Provide temporary guy lines to achieve proper alignment of the structures as erection proceeds.

13. Anchor Bolts:

    a. Furnish anchor bolts and other connectors required for securing structural steel to in-place work.

    b. Utilize templates and other devices as necessary for presetting bolts and other anchors to accurate locations.

14. Setting Bearing and Base Plates:

    a. Clean concrete and masonry bearing surfaces of bond- reducing materials and roughen to improve bond to surfaces. Clean the bottom surface of base and bearing plates.

    b. Set loose and attached base plates and bearing plates for structural members on wedges, or other adjustable devices where specified.

    c. Tighten the anchor bolts after the supported members have been positioned and plumbed. Do not remove wedges or shims; but if protruding, cut off flush with the edge of base or bearing plate prior to packing with mortar.

    d. Mix bedding mortar in strict accordance with the manufacturer's instructions.

    e. Pack or pour bedding mortar solidly around bearing surfaces and bases of plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and cure in strict compliance with manufacturer's instructions, or as otherwise required.

15. FIELD CONNECTIONS

    a. High-strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

    b. Weld Connections: Comply with AWS D1.1 and AWS D1.8 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

        i. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

        ii. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

        iii. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

C. Touch-up Painting:

1. After erection of structural steel, all dirt, grease, film or any other stains shall be thoroughly cleaned from all surfaces. All areas where the shop coat of paint has been scratched or damaged, all bolts and all welded areas shall be thoroughly cleaned and sanded to bare metal and painted, using the same type paint as was used for the shop coat.

2. The touch-up shall be applied to the top flanges of the structure prior to the installation of the metal roof deck.

3.3 FIELD PAINTING

1. Field paint below-grade surfaces and with asphalt type paint.

2. Field paint un-galvanized steel surfaces exposed in cavity behind masonry veneer with asphaltic type paint.

3. Field paint columns below finished floor elevation with asphaltic type paint.

3.4 FIELD QUALITY CONTROL

A. The Owner will engage an independent testing agency or engineer to inspect high-strength bolted connections and welded connections, and to perform tests and prepare test reports. Contractor shall coordinate testing.

B. Testing Program:

1. Testing agency shall conduct and interpret tests as subsequently required herein, shall state in each report whether test specimens comply with requirements, and shall specifically state any deviations. Visual inspection of typical bearing type bolted shear connections and single-pass fillet welds shall be performed by the engineer.

2. Shop and Field Welding: Inspect and test during fabrication and erection of structural steel assemblies in accordance with AWS D1.1 Structural Welding Code and as follows:

a. Conduct inspections and tests as required. Record types and locations of all defects found in the work. Record work required and performed to correct deficiencies.

b. Perform visual inspection of all welds.

c. 100% of full penetration and partial penetration welds shall be subjected to and satisfy the requirements of ultrasonic testing in accordance with ASTM E 164, unless otherwise specified.

d. 10% of fillet welds shall be subjected to and satisfy the minimum requirements of magnetic particle testing and weld gauge measurement, unless otherwise specified. The welds shall be selected by the Engineer of Record and the testing agency.

e. Perform additional tests to reconfirm any noncompliance of the original work and as may be necessary to show compliance of corrected work. Retesting of non-compliant work will be at contractor’s expense.

3. Bolted Connections: The laboratory will test with a torque wrench high strength bolts for proper tightening in accordance with AISC, as follows:

a. Visually inspect all bolts and bolted connections.

b. Test 10% of all bolts to be tensioned for proper tightening. All bolts that fail shall be corrected and retested.

c. Perform additional tests to reconfirm any non-compliance of the original work and as may be necessary to shown compliance of corrected work. Retesting of non-compliant work will be at contractor's expense.

d. Correct conditions in the Work that test reports and inspections do not comply with the Contract Documents.

C. Cooperation of Contractor with Testing Agency:

1. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished as required by Designer.

2. Contractor shall assist testing laboratory by providing access to all bolts and welds to be inspected.

3.5 CORRECTION OF WORK

A. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to not be in compliance with requirements and at no additional expense to Owner.

B. Additional testing as required for inspection of corrected work shall be at Contractor's expense.

END OF SECTION 05 12 00

SECTION 05 31 00
STEEL DECKING

PART 1 : GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof deck.
2. Form deck.
3. Composite floor deck.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of steel deck, signed by product manufacturer.

B. Welding certificates

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements
1. Powder-actuated mechanical fasteners
2. Acoustical roof deck.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

C. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

D. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

E. Electrical Raceway Units: Provide UL-labeled cellular floor-deck units complying with UL 209 and listed in UL's "Electrical Construction Equipment Directory" for use with standard header ducts and outlets for electrical distribution systems.

F. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 : PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, Available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. ASC Profiles, Inc.; a Blue Scope Steel company.
   2. Canam United States; Canam Group Inc.
   3. CMC Joist & Deck.
   4. Consolidated Systems, Inc.; Metal Dek Group.
   5. Cordeck.
   6. DACS, Inc.
   7. Epic Metals Corporation.
   8. Marlyn Steel Decks, Inc.
   9. New Millennium Building Systems, LLC.
   10. Nucor Corp.; Vulcraft Group.
   11. Roof Deck, Inc.
   12. Valley Joist; Subsidiary of EBSCO Industries, Inc.
   13. Verco Manufacturing Co.

14. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.

   a. Color: [Manufacturer's standard] [Gray] [White] [Gray top surface with white underside].

2. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
3. Deck Profile: 1-1/2" deep, 20 gauge: Type B (wide rib); Moment of Inertia (Ip) not less than 0.201 in^4/ft. and (In) not less than 0.222 in^4/ft.; Section Modulus (Sp) not less than 0.234 in^3/ft. and (Sn) not less than 0.247 in^3/ft.
4. Profile Depth: 1-1/2" deep
5. Retain one steel thickness from "Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate" Subparagraph below if cellular roof deck, combining a roof-deck profile with a bottom plate, is required. Thickness combinations are based on deck unit (first) and bottom plate (second).
6. Span Condition: Triple span or more.
7. Side Laps: Interlocking seam.

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Fasteners for attaching metal deck to supports shall be one of the following "TEKS Self-Drilling Fasteners - TEK/4 or TEK/5" as manufactured by Builder Division of Illinois Tool Works, Inc., Elk Grove Village, Illinois 60007 or an approved equal. All fasteners are to be coated with the "Climaseal Coating.

C. Side-Lap Fasteners: Fasteners for attaching side laps shall be "TEKS Self-Drilling Fasteners - TEKS/1 with Hex Washer Heads" as manufactured by Builder Division of Illinois Tool Works, Inc. All fasteners are to be coated with the "Climaseal Coating". No. 10 minimum diameter.

D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

E. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.

F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

G. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

H. Flat Sump Plates: Single-piece steel sheet, 0.0747-inch-thick, of same material and finish as deck. For drains, cut holes in the field.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0747-inch-thick, with factory-punched hole of 3/8-inch minimum diameter.

J. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

PART 3 : EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30 or 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
   1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members with corrosion resistant fasteners or welds (where approved) with a minimum of three fasteners per sheet at each support:
   1. Self-drilling screws: #12 with Hex washer heads and organic zinc/chromate or cadmium /chromate coating.
   2. Powder or pneumatically actuated fasteners (PAF's): When submitted and approved: Driven or shot pins having equivalent capacity to 5/8 inch diameter welds, with corrosion protection and inspection capabilities.

3. Welds Diameter: When submitted and approved; 5/8-inch nominal cleaned and touched up with (3) coats of zinc primer after welding, install weld washers at each location. Do not weld to steel supports ¼" inches or less in thickness and all K-series or KCS-series joists, use self-tapping fasteners or PAFs.
4. Drill pilot holes when attaching screw fasteners to support steel thicker than 1/2" unless authorized otherwise by Engineer.

B. Fastener Spacing: Weld/screw edge and interior ribs of deck units with a minimum of three welds/screws per deck unit at each support. Space welds/screws 12 inches apart in the field of roof and 6 inches apart in roof corners and perimeter, unless otherwise indicated on the Drawings.

C. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 36 inches, and as follows:
1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
2. Fasten with a minimum of 1-1/2-inch- long welds (where welding is approved).

D. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
1. End Joints: Lapped 2 inches minimum.

E. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.

F. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor, Owner, and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 31 00

SECTION 05 50 00
MISCELLANEOUS METAL FABRICATIONS

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Structural steel (Section 05 12 00).
2. Metal decking (Section 05 31 00).
3. Anchors, bolts, sleeves and supports required for installation of plumbing, mechanical and electrical equipment (Divisions 22, 23 and 26).

B. Work Included This Section:

1. Work to be provided includes all metal fabrications expressly specified. In addition, all miscellaneous framing, bracing, supports, and other items required for proper conduct of the work is included under this Section even if not specifically shown on the Drawings or specified. All miscellaneous metal framing and bracing required to fabricate and install the work indicated on the Drawings shall be provided as a part of the work under this Section if not expressly specified in other Sections of these Specifications.

1.3 INDUSTRY STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

The American Society for Testing and Materials International (ASTM)
Aluminum Association (AA)
Corps of Engineers (CE)
Federal Specifications (FS)
American Iron and Steel Institute (AISI)
American Welding Society (AWS)

1.4 SUBMITTALS:

A. Shop Drawings: Submit shop drawings for all shop fabricated work of this Section. Show layout, location, arrangement, details, sizes, materials, connections, finishes and relation to adjacent work.

1. Provide templates for anchors and bolts specified for installation under other Sections.

B. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

Welding: Qualify procedures and personnel according to the following:

AWS D1.1, "Structural Welding Code--Steel."
AWS D1.2, "Structural Welding Code--Aluminum."
AWS D1.3, "Structural Welding Code--Sheet Steel."

Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.6 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2: PRODUCTS

2.1 MATERIALS: Except as required specifically otherwise elsewhere in the Contract Documents, the following material requirements shall apply to this Section:

A. Ferrous Metals:

1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

2. Steel Plates, Shapes, and Bars: ASTM A 36.

3. Steel Bar Grating: ASTM A 569 or ASTM A 36.

4. Steel Tubing: Cold-formed, ASTM A 500; or hot-formed, ASTM A 501.

5. Steel Sheet: Hot-rolled, ASTM A 570; or cold-rolled, ASTM A 611, Class 1; of grade required for design loading.

6. Galvanized Steel Sheet: ASTM A 653, of grade required for design loading. Coating designation as indicated, or if not indicated, G90.

7. Steel Pipe: ASTM A 53; type and grade (if applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (Schedule 40), unless otherwise indicated.

8. Gray Iron Castings: ASTM A 48, Class 30.

9. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.

10. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

11. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

B. Aluminum Metals:

1. For extruded aluminum, AA Alloy No. 6063-T5.

2. Fasteners for Aluminum: Use fasteners made of same basic metal as fastened metal except use galvanized fasteners complying with ASTM A 153 for exterior aluminum units, unless otherwise indicated. Do not use metals which are corrosive or incompatible with metals joined.

C. Stainless Steel:

1. Provide austenitic stainless steel in form indicated complying with the following requirements:

(a) Tubing: ASTM A 554, Grades MT 301, MT 302, or MT 304, as standard with manufacturer.

(b) Pipe: ASTM A 312, Grade TP 304.

(c) Castings: ASTM A 743, Grade CF 8 or CF 20.

(d) Plate: ASTM A 167, Type 301, 302, or 304.

2. Finish for all stainless steel exposed to view is to be AISI #8 polished finish.

D. Grout:

1. Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.

E. Fasteners:

1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

2. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.

3. Lag Bolts: Square head type, FS FF-B-561.

4. Machine Screws: Cadmium plated steel, FS FF-S-92.

5. Wood Screws: Flat head carbon steel, FS FF-S-111.

6. Plain Washers: Round, carbon steel, FS FF-W-92.

7. Masonry and Concrete Anchorage Devices: Wedge type expansion anchor such as Hilti-Kwik II, Phillips Wedge, Wej-It, or equal approved in writing by the Architect.

8. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.

9. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

F. Concrete Fill:

1. Concrete Materials and Properties: Comply with requirements of Division 3 section "Concrete Work" for normal weight, ready-mix concrete with minimum 28-day compressive strength of 3,000 psi concrete.

G. Shop Paint:

1. Non-Galvanized Surfaces: PPG Speedhide Inhibitive Red Primer 6-208 or approved equal.

2. Galvanized Surfaces: PPG Speedhide Galvanized Steel Primer 6-209 or approved equal.

2.2 FABRICATION:

A. Work shall be well formed to shape and size, with sharp lines and angles. Shearing and punching shall leave clean, true lines and surfaces. Weld or rivet permanent connections. Do not use screws or bolts where they can be avoided; but where used, heads shall be countersunk, screwed up tight and threads nicked to prevent loosening. Curved work shall be evenly sprung.

B. Castings shall be sound and free from warp, holes and other defects that impair their strength or appearance. Exposed surfaces shall have a smooth finish and sharp, well defined lines and arrises. Machined joints, where required, shall be milled to a close fit. Provide necessary rabbets, lugs and brackets so that work can be assembled in a neat, substantial manner.

C. Fastenings shall be concealed where possible. Thickness of metal, and details of assembly and supports, shall have ample strength and thickness. Joints exposed to weather shall be formed to exclude water. Provide holes and connections for the work of other trades.

D. At proper time, deliver and set in place items of metal work to be built into adjoining construction.

2.3 WELDING:

A. All welding shall be done by experienced welders certified by an accredited testing laboratory for the particular type of welding involved in accordance with the rules of the American Welding Society.

B. All welds shall be power tool cleaned and the weld and surrounding area where the paint or galvanized coating has been burned away shall be painted with the type of paint specified for galvanized or non-galvanized surface as applicable.

2.4 PAINTING AND GALVANIZING:

A. Clean metal (to receive paint) with cleaner specified under Section 09910 for use with specific metal.

B. Except as required specifically otherwise in the Contract Documents, apply primer on ferrous metal work as specified herein.

C. Where hot-dipped galvanized or zinc-coated metal is required, it shall not be shop primed unless specifically called for, but all damaged places and welding's shall be touched up with zinc-rich primer where shop priming is not called for. Where hot-dipped galvanizing or hot-zinc coating is specified, it shall be done in accordance with the Standard Specifications of the American Hot Dip Galvanizers Association.

D. Galvanizing: All exterior steel to be galvanized.

1. Hot-dip galvanizing or zinc coatings applied on fabricated steel products shall comply with ASTM A 123.

2. Galvanized surfaces for which a shop coat of paint is specified shall be chemically treated to provide a bond for the paint.

3. Vent and drain holes in items to be hot dip galvanized shall be drilled and not burned so that holes are precise and neat. Holes that are visible and detract from the attractiveness of the installed item shall be plugged as directed by the Architect.

2.5 STEEL LADDER:

A. Fabricate Elevator Pit Ladders as detailed on Drawings from structural steel specified in this Section. Shop prime paint. Field paint as specified in Section 09 91 00

2.6 MISCELLANEOUS REINFORCING AND BRACING:

A. Provide miscellaneous metal shapes as detailed on Drawings for bracing and support of related work where not required specifically elsewhere in the Contract Documents.

B. Shop paint ferrous metal.

2.7 FERROUS PIPE RAILS:

A. Fabricate pipe railings from 1 1/2" o.d. (unless shown otherwise) standard weight, mild steel pipe. Use galvanized pipe and other components of the railing system for exterior railings.

B. Fabricate rails to design shown. Use flush type joints welded, and welds ground smooth. Grinding shall leave no dips in the profile of the pipe.

C. Wall rails shall be secured to wall with brackets with expansion or toggle type of device appropriate for wall material. Fasten securely and leave free of play.

D. Paint all welded area where galvanized coating is burned away or otherwise damaged with zinc rich primer.

E. Provide steel sleeves for anchoring newels into floor. Install with non-metallic non-shrink grout specified.

F. Shop prime paint and field finish paint as specified in Section 09 91 00.

2.8 WALL RAIL BRACKETS:

A. Provide brackets for wall handrails; space brackets not to exceed 6'-0" o.c. Brackets shall be similar to Type 306 as manufactured by Julius Blum & Company and secured to wall with expansion bolts or toggle bolts.

2.9 STEP SAFETY NOSINGS:

A. Furnish and install abrasive safety tread nosing on exterior concrete stair treads.

Type 231 BF "Supergrit" as manufactured by Wooster Products, Inc.
Type 3511 "SureStep" as manufactured by American Safety Tread Co.
300 Series Bighorn Series as manufactured by ACL Industries.

PART 3: EXECUTION

3.1 PREPARATION:

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.2 INSTALLATION - GENERAL:

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

E. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.

3.3 SETTING LOOSE PLATES:

A. Clean concrete and masonry bearing surfaces of any bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

1. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use nonmetallic non-shrink grout in exposed locations, unless otherwise indicated.

2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 INSTALLATION OF STEEL PIPE RAILINGS AND HANDRAILS:

A. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:

1. Anchor posts in concrete by means of pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's directions.

(a) Non-shrink grout.

(b) Leave anchorage joint exposed, wipe off surplus anchoring material, and leave 1/8” build up, sloped away from the post. For installations exposed on exterior, or to flow of water, seal anchoring material to comply with grout manufacturer’s directions.

3. Anchor posts to steel with steel flanges, angle type or floor type as required by conditions, welded to posts and bolted to steel supporting members.

4. Anchor rail ends into concrete and masonry with steel round flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.

5. Anchor rail ends to steel with steel oval or round flanges welded to rail ends and bolted to structural steel members, unless otherwise indicated.

B. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1 1/2" clearance from inside face of handrail and finished wall surface. Locate brackets as indicated, or if not indicated, at spacing required to support structural loads. Secure wall brackets and wall return fittings to building construction as follows:

1. Use type of bracket with pre-drilled hole for exposed bolt anchorage.

2. For concrete and solid masonry anchorage, use drilled in expansion shield and either concealed hanger bolt of exposed lag bolt, as applicable.

3. For hollow masonry anchorage, use toggle bolts having square heads.

4. For steel framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors using self-tapping screws of size and type required to support structural loads.

C. Expansion Joints: Provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40'. Provide slip joint with internal sleeve extending 2" beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6" of posts.

3.5 ADJUSTING AND CLEANING:

A. Touch-Up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section PAINTING of these Specifications.

B. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05 50 00

SECTION 05 81 00
PREFABRICATED EXPANSION JOINT COVERS:

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

B. Related Work Specified Elsewhere:

1. Concrete work (Sections of Division 3).
2. Sealant work (Section 07 92 00).
3. Unit Masonry (Section 04 20 00).
4. Gypsum Drywall (Section 09 29 00).

C. Work Included This Section:

1. Prefabricated expansion joint covers as shown on Drawings and as specified. Include all accessory materials required for complete and proper installation of the covers. Coordinate with other trades.

1.3 SUBMITTALS:

A. Shop Drawings: Show location, arrangement, dimensions, materials, finishes, connections, anchorage and relation to adjacent work.

B. Manufacturer's Data: Submit manufacturer's printed technical specifications and literature completely describing each type of cover and installation instructions.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS: Subject to compliance with the Drawings and Specifications, provide product by one of the following, or equal approved in writing by the Architect:

Architectural Art
C/S Group
Balco Inc.
M M Systems Inc.
Nystom Building Products

2.2 MATERIALS:

A. All prefabricated expansion joint systems shall be manufactured to permit minimum free movement of ± 50% of the joint width without joint failure.

B. Expansion joints shall be fabricated from extruded aluminum 6063-T5 with standard mill finish on floor covers and unexposed surfaces. Aluminum extrusions shall receive zinc chromate factory coating on all surfaces in contact with concrete or masonry materials.

C. Filler strips shall be elastomeric strips dual-locked to continuous tongue and groove extrusion and backed with a material having expansion/contraction characteristics equal to joint filler.

D. Anchors for floor systems shall be non-corrosive, electrolytically inert concrete anchor bolts. All fasteners shall be concealed.

E. Furnish joint assemblies in 20' lengths with sealed or slip joint covers. Fabricate corners and turns in factory to interface with wall joints and gutter details.

F. Schedule: In order to describe type and quality of expansion joint covers intended, model numbers of Balco Expansion Joints Covers are shown on the drawings. See Paragraph "Acceptable Manufacturers" for other acceptable manufactures. See Sheets A2.1 and A8.12 for required expansion joints.

PART 3: EXECUTION

3.1 INSTALLATION:

A. Install in accordance with the Drawings and these Specifications, and approved shop drawings and in accordance with manufacturer's printed instructions.

B. Butt joints within continuous runs shall be maximum of 20' apart and shall be sealed during installation using manufacturer's butt joint sealing method.

C. Work shall be secure yet provide for thermal movement.

END OF SECTION 05 81 00

SECTION 06 10 00
ROUGH CARPENTRY

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Finish carpentry work (Section 06 20 00).
2. Cabinet work (Section 06 41 00).
3. Single-ply roofing (Section 07 54 00).

B. Work Included This Section:

1. Rough carpentry work as shown on Drawings and as specified herein. Include wood nailers, blocking, furring, grounds, sheathing, rough hardware, framing, shoring, bracing, scaffolding and barriers required for installation of the work shown on the Drawings. Include preservative treated wood curbs and nailers for roofing work specified in Section 07 54 00.

2. Rough carpentry work generally includes carpentry work provided on the job that is concealed from view in the completed work.

1.3 SUBMITTALS:

A. Certificates:

1. Submit certificates from applicator of preservative treatment, stating type of treatment, manufacturer of treating chemical material, degree of treatment of wood members processed for this Project. Certificate shall be signed by an officer of the company.

2. Submit certificates certifying that flame spread, fuel contributed, and smoke developed rating of the fire retardant treated wood meets or is below limits required by applicable codes and requirements of this Section. Include manufacturer's literature describing type of treatment, manufacturer and description of treating chemical material and degree of treatment of wood members processed for this Project.

1.4 PRODUCT HANDLING:

A. Materials which are delivered to the Project Site in a wet condition shall be rejected, removed from the Project Site and replaced with new and dry materials without additional cost to the Owner. Stack materials in dry storage which furnishes proper ventilation, drainage and protection from the elements. Stack in such a way that will prevent warpage.

B. See moisture content requirements hereinafter.

1.5 INDUSTRY STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

American Lumber Standards Committee (ALSC)
American Plywood Association (APA)
American Wood Preservative Association (AWPA)
Underwriter's Laboratories Inc. (UL)
U. S. Department of Commerce
Product Standards (PS)

PART 2: PRODUCTS

2.1 MATERIALS:

A. Moisture Content: Solid wood and plywood preservative treated, and fire retardant treated shall be dried to a maximum moisture content of 19%. Untreated solid wood and plywood shall also be dried to a maximum moisture content of 19%.

B. Grade and Trademark: Grade and trademark shall be on each piece of lumber (or bundle in bundled stock). Use only the recognized official marks of the Association under whose rules it is graded.

C. Quality: Lumber shall be sound, thoroughly seasoned, well manufactured and free from warp that cannot be corrected in process of bridging or nailing.

D. Grades and Species of Solid Wood: Grades and species of lumber shall be as follows:

1. Grounds, Blocking, Nailers, Furring and Miscellaneous Uses: No. 2 Southern Yellow Pine.

E. Plywood:

1. Fir or pine plywood conforming to PS 1 of the U. S. Dept. of Commerce, and mfd. by a member of the American Plywood Assn. Provide interior plywood with exterior glue, (except for roofing or exterior wall work and elsewhere as noted on the Drawings, provide exterior grade plywood with exterior glue) of thicknesses shown on the Drawings and grades as follows:

(a) Provide C-D face veneers where concealed from view. If exposed to view in the finished work, provide A Grade on the exposed face.

(1) Sub-Floor: Standard C-D INT-APA 36/16, exterior glue, softwood plywood.

(2) Underlayment: Underlayment INT-APA, T & G, 36/16.

F. Rough Hardware:

1. Except as specifically required otherwise in the Contract Documents, furnish and install all rough carpentry hardware and metal fasteners as shown on the Drawings specified herein or required for proper installation of carpentry. Nails, spikes, screws, bolts and similar items shall be of sizes and types to rigidly secure members in place.

G. Preservative Treatment:

1. Where lumber or plywood is required to be preservative treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.

2. For exposed items indicated to receive stain finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

3. Pressure treat aboveground items with waterborne preservatives to a minimum retention of .25 lb/cu ft. (4.0 kg/cu. m)

4. Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to a minimum retention of .40 lb/ cu. ft. (6.4 kg/ cu. m.)

5. Treated material showing delamination, cracking or other structural defects shall be rejected.

H. Fire Retardant Treatment:

1. Where fire-retardant-treated wood is required, comply with applicable requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classifications marking of UL; US Testing Timber Products Inspection, Inc; or another testing and inspecting agency acceptable to authorities having jurisdiction. The label or stamp shall be such as to further designate that there is no change in the listed classification when the material has been subjected to the standard Underwriter's Laboratories rain test.

2. Treatment shall not in any way adversely affect roofing materials nor products containing gypsum, pitch, petroleum and petroleum by-products.

PART 3: EXECUTION

3.1 INSTALLATION:

A. Wood Grounds, Blocking, Nailers, Curbs, Furring and Other Miscellaneous Uses:

1. Provide wood grounds, blocking, nailers, curbs, furring, etc. of size and shape required for bringing materials to a true surface, for securing wood trim and where required to secure other work or equipment in place. All work shall be accurately set in place, plumb, true, even, in perfect alignment and securely fastened. Accurately and carefully fit, cut, and finish flush, straight and true. Wood blocking or nailers on steel framing shall be bolted thereto.

2. Install wood furring as shown on Drawings. Secure to substrate with appropriate fasteners to provide rigid, permanent connections. Shim furring out as necessary to bring furring to true planes.

3. Install nailers at roof perimeters and at all penetrations of roofing for securing work and flashing in place. Secure nailers to roof deck and make flush with insulation or as shown otherwise on the Drawings. Anchor wood nailers to resist a force of 75 lbs/LF in any direction. The thickness of the nailer shall be such that the top of the nailer is flush with the surface to which the roofing membrane is to be applied as shown on the membrane manufacturer's approved details and approved shop drawings.

B. Locations of Treated Wood:

1. Use preservative treated wood where noted on the Drawings, where wood is in contact with masonry or concrete, for blocking and nailers used in roof construction and wherever used in exterior walls. If the wood is in a location requiring fire retardant treatment, then the wood shall be fire retardant treated rather than preservative treated.

2. Use fire retardant treated wood at the following locations:

   (a) Return air plenums.

   (b) Where located in fire rated walls, ceilings, floors, or other fire rated construction.

   (c) Where shown on the Drawings.

   (d) Electrical rooms.

   (e) Where required by the North Carolina State Building Code or other prevailing codes.

END OF SECTION 06 10 00

SECTION 06 20 00
FINISH CARPENTRY

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Rough carpentry (Section 06 10 00).
2. Hollow metal doors and frames (Section 08 11 00).
3. Wood doors (Section 08 14 00)
4. Finish hardware (Section 08 71 00).
5. Painting and finishing (Section 09 91 00).
6. Sinks and fittings for plumbing (Division 22)

B. Work Included This Section:

1. All work of a finish carpentry nature that is shown on the Drawings or specified herein and not included in Section 06 10 00 - Rough Carpentry.

2. Finish carpentry work generally includes carpentry work fabricated and assembled on the job that is exposed to view in the completed work.

3. Installation of doors and frames and installation of finish hardware thereon.

1.3 INDUSTRY STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

Architectural Woodwork Institute (AWI)
U. S. Department of Commerce
Commercial Standards (CS)
Product Standards (PS)

1.4 QUALITY STANDARDS:

A. Materials shall comply with the requirements of AWI Quality Standards, latest edition, for "Custom Grade" work.

B. Workmanship shall comply with requirements specified, shown on the Drawings and shall be in accordance with standards established in the industry for the particular type of work involved.

1.5 QUALIFICATIONS:

A. Fabricator of finish carpentry work shall have a reputation for doing satisfactory work, on time, and shall have completed comparable work to that specified and indicated for this Project. Fabricator shall be equipped with the basic equipment and machinery required to produce the quality of work specified

1.6 SUBMITTALS:

A. Shop Drawings: Show kind of materials, colors, finish, size of members, method of securing members together and to adjacent work.

1.7 PRODUCT HANDLING:

A. Storage and Protection:

1. Protect work from dampness during and after delivery. Store under cover in a well-ventilated building and where not exposed to extreme changes in temperature or humidity. Do not store or install work in any part of building until concrete, masonry and other wet work is dry or until the air conditioning system is operating under control to prevent fluctuation of temperature and humidity.

PART 2: PRODUCTS

2.1 MATERIALS:

A. Solid wood shall be kiln-dried so that moisture content shall not exceed limits required in the referenced woodworking quality standard.

B. Grades and Species of Solid Wood:

1. Grades and species of wood shall be as described hereinafter, unless a particular species is indicated or specified for a particular application.

2. Softwood for Painted Finish: AWI Grade II Douglas Fir.

3. Hardwood for Painted Finish: AWI Grade II Poplar, Gum or Birch.

4. Softwood for Concealed Rough Woodwork: C and Better Grade Southern Yellow Pine or Douglas Fir.

C. Softwood Plywood:

1. Fir plywood conforming to PS 1 and produced by a member of the American Plywood Association, interior type with interior glue.

2. Use Grade A where exposed to view and Grade C where completely concealed. Use Grade B for surfaces to receive plastic laminate.

D. Particleboard: Medium density filled wood particleboard conforming to C.S. 236, Type 1. B2. Provide one of the following, or equal approved in writing by the Architect.

1. “Novoply” as mfd. by US Plywood Corporation.
2. “Versabord” as mfd. by Weyerhaeuser Company.
3. “Flakeboard” as mfd. by Formica Corporation.

E. Plastic Laminate:

1. One of the following: “Nevamar” as mfd. by Nevamar Company; “Formica” as mfd. by the Formica Corporation; “Micarta” as mfd. by Westinghouse; “Pionite” as mfd. by Pioneer-Plastics Corp; or “Wilsonart” as mfd. by Wilsonart Brand Decorative Laminate.

2. Colors and patterns will be selected by the Architect. Use 0.50” thickness unless indicated or specified otherwise.

3. Waterproof adhesive as recommended by manufacturer of plastic laminate for the indicated application.

F. Preservative Treatment:

1. Where wood will be in contact with masonry or concrete, wood shall be pressure-treated to comply with applicable requirements of AWPA C2 (lumber) and AWPA C27 (plywood).

G. Shelf Standards and Brackets: Shelving standards to be Knape & Vogt Co. #80 A Satin Anochrome with #180A brackets, or equal approved in writing by the Architect by Stanley, Grant or Hafele.

H. Edge Banding: Plywood edges that would be exposed to view in the completed work shall be edge banded with the specified solid wood. Edge banding shall be minimum of 1 1/2" wide and shall be tongue and grooved and glued to the plywood panel.

PART 3: EXECUTION

3.1 COORDINATION:

A. It shall be the responsibility of the General Contractor to coordinate the work of this Section with the work of other trades.

3.2 QUALITY:

A. No installation shall proceed until all parties agree that the job site is ready to accept finish carpentry. All wet trades must be completed in areas which are to receive finish carpentry items. Humidity levels shall be as close as possible to that of the future finished occupied space. Dirt and any other foreign matter must be at acceptable minimum levels.

3.3 INSTALLATION:

A. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacturer with respect to surfaces, sizes or patterns.

B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'0" for plumb and level; and with 1/16" maximum offset from flush.

C. Scribe and cut work to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Anchor finish carpentry work to anchorage devices or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Use fine finishing nails for exposed nailing's, countersunk and filled flush with finished surface with wood putty of type specified in Section 09 91 00.

E. Work shall be finished smooth and free from machine or tool marks that will show through the finish. All exposed to view nail heads shall be set to receive putty.

F. All joints shall be tight and formed to conceal shrinkage. Miters 4" or more from heel to point shall be glued and secured with clamp nails, finish nails or equal method.

G. Provide blocking and lookouts as required for securing work in place. Do not install any trim or wood molds until all surfaces have been primed and back-primed. Where required, carefully scribe woodwork to masonry and other adjacent work.

H. Set work plumb, level and without wracking.

I. Plastic Laminate Work:

1. Cutouts in plastic laminate shall have minimum 1/4" radius at corners to prevent stress cracking at corners.

2. Sharp inside corners without radius will not be acceptable.

3.4 LOCATIONS OF TREATED WOOD:

A. Use preservative treated wood where noted on the Drawings and where wood is in contact with masonry or concrete.

3.5 FINISHING:

A. All work in this Section shall be finished as specified in Section 09 91 00 except for back priming with one coat of clear sealer, which shall be applied under this Section.

3.6 CLEANING AND PROTECTION:

A. All work under this Section shall be carefully protected during shipment, storage and installation. After installation, all work shall be protected from damage at all times until the Owner takes possession of the Project. Special care is to be taken at all outside corners to avoid damage.

B. During installation, all existing work shall be protected from damage.

C. During installation, job shall be kept clean and free of excessive debris.

D. After completion of all work of this Section and at a time specified by the Architect, all exposed surfaces and finished materials shall be thoroughly cleaned, and any damaged surfaces shall be repaired to the complete satisfaction of the Architect.

E. At completion of the work under this Section, all areas shall be left broom clean.

END OF SECTION 06 20 00

SECTION 07 13 10
SHEET APPLIED WATERPROOFING AND DRAINAGE COMPOSITE

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Concrete work (Section 03 30 00).

B. Work Included This Section:

1. Sheet membrane waterproofing below grade retaining walls and other locations where indicated on the Drawings.

2. Drainage mat applied against the waterproofing membrane.

3. All supplementary materials and work required for a proper and complete installation.

1.3 SUBMITTALS:

A. Product data: Submit manufacturer's specifications including technical data and installation instructions, for approval of the Architect.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashing, penetrations, inside and outside corners, tie-ins with adjoining waterproofing.

C. Sample: Submit 4-by-4-inch waterproofing membrane and drainage mat.

D. Submit copy of the 5-year installer warranty for approval of the Architect prior to beginning any work.

1.4 QUALITY ASSURANCES:

A. Installer’s Qualifications: An approved applicator who is authorized by waterproofing manufacturer to install manufacturer’s products.

B. Source limitations: Obtain waterproofing materials and all supplementary materials necessary from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to site in original packages with seals unbroken, labeled with manufacturer’s name, product brand name and type, date of manufacture, and directions for storing.

B. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS:

A. Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply to damp or wet substrates. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.7 PREINSTALLATION CONFERENCE:

A. Conduct conference at Project site. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.8 WARRANTY:

A. General Contractor shall provide written waterproofing installer's warranty, signed by the installer, covering work of this Section, for a warranty period of 5 years beginning at time of Project Acceptance. Warranty shall include labor and materials to correct leakage within warranty period.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND PRODUCTS:

A. Subject to compliance with the Drawings and Specifications, provide one of the following, or equal approved in writing by the Architect:

Bituthene by W.R. Grace
CCW-701 by Carlisle Coatings & Waterproofing
Duramem 700 SM by Pecora
Enkadrain by Enka Building Products
Mel-Rol by W.R. Meadows
TC Miradri by Mirafi
Polyguard No. 650 by Polyguard Products
Colphene 3000 by Soprema

2.2 MATERIALS:

A. Rubberized-asphalt sheet: 60 mil thick, self-adhering sheets consisting of 56 mil rubberized asphalt, or equal polymer, laminated to 4 mils thick, polyethylene film with release liner on adhesive side. The membrane shall incorporate the following, or better of physical properties:

Property	Value	Test Method
Tensile strength	250 psi	ASTM D412 Die C
Ultimate elongation	300% minimum	ASTM D412 Die C
Low Temperature Flex.	Pass at minus 20 deg F	ASTM D1970
Crack Cycling	Unaffected after 100 cycles	ASTM C836
Puncture Resistance	40 lbf minimum	ASTM E154

Hydrostatic-head resistance	150 feet minimum	ASTM D5385
Water Absorption	0.15 % weight-gain max.	ASTM D570
Vapor permeance	0.05 perms	ASTM E96 Water method

B. Primer, mastic, adhesive, flashing and other application materials shall be those expressly furnished by or recommended by the manufacturer of the waterproofing membrane.

C. Protection Board Georgia Pacific 1/2" thick asphalt hardboard: pre-molded semi-rigid protection board consisting of bitumen, mineral core and reinforcement.

D. Drainage Mat:

1. The drainage mat product shall consist of a filter fabric heat-bonded to the compression resistant three-dimensional drain core.

2. Include all supplementary materials and accessories required for a complete and proper installation in accordance with the manufacturer's recommendations.

3. Drainage composite shall be Hydroduct 220 drainage by WR Grace.

E. Drainage Tile/ Pipe: 6” perforated PVC drainage tile/ pipe. Wrap with filter fabric around 12” crush stone gravel.

F. Metal Termination Bars: Aluminum bars approximately 1 by 1/8-inch-thick, predrilled at 9-inch centers. All waterproofing to receive termination bar in addition to mastic.

PART 3: EXECUTION

3.1 INSTALLATION:

A. Sheet Membrane Waterproofing and Drainage Composite:

1. Surface Preparation: Surfaces to be treated shall be clean and dry, smooth and free from deleterious and excess materials and projections. Joints shall be neatly struck. Holes, honeycomb, cracks or cavities shall be pointed or filled and finished flush with polymer modified repair mortar. Ridges and imperfections shall be ground down. Surfaces to be treated shall be primed using not less than 1 gallon of priming material for each 100 sq. ft. of surface.

2. Waterproofing Membrane: Membrane shall be applied in strict accordance with the manufacturer's published recommendations in addition to the general instructions noted.

a. Membrane shall be applied to surfaces dry, free from dirt, and primed in accordance with the recommendations of the membrane manufacturer. Membrane shall be laid from low points or drains toward high points in shingle fashion. Each strip shall overlap a minimum of 2 1/2" and shall be rolled down firmly and completely. Membrane shall be turned up not less than 3" at walls and partitions in a concealed manner.

b. All inside and outside corners shall be double covered with membrane by applying an initial strip of minimum 12" width centered along the axis of the corner. A cant strip shall be used on inside corners. Outside corners shall be rounded.

c. Construction and control joints shall be double covered with membrane. A double thickness of membrane shall be applied over properly sealed expansion joints. Lap double cover a minimum of 6” past control joints.

d. The perimeter of the membrane placed in any day's operation and all outside edges of membrane shall have a troweled bead of manufacturer's recommended mastic applied after the membrane is placed.

e. Areas around drains, posts, or other protrusions shall have a double layer of membrane and shall be liberally coated with mastic after the application of the membrane.

f. Membrane shall not be allowed to contact incompatible materials such as tars, pitches, and certain liquid waterproofing products and sealants. Application materials shall be those recommended by the manufacturer of the membrane.

g. Membrane provided on walls where drainage composite is required shall be covered with the drainage composite specified installed in accordance with the manufacturer's published instructions. Composite shall be applied within 5 days after membrane application, even if backfill will be placed later.

h. Drainage composite shall be applied with adhesive, or other method recommended by the manufacturer that does not penetrate the waterproofing membrane. Use of anchors or fasteners that puncture or penetrate the waterproofing membrane will not be allowed.

i. At locations where perforated subdrainage pipe occurs, the filter fabric shall be wrapped around the entire diameter of the pipe to prevent earth from entering the pipe but allow the passage of water.

j. Immediately before covering the membrane, inspection will be made by the Architect. No membrane shall be covered without approval of the Architect. Any holes, tears, misaligned or wrinkled seams or other discontinuities shall be sealed with membrane or mastic.

k. Install protection course with butted joints over waterproofing membrane.

l. If not shown, foundation drains shall be connected to the nearest, appropriate storm drainage structure. Slope foundation drains a minimum of 1% to storm drainage structure.

END OF SECTION 07 13 10

SECTION 07 20 00
RIGID INSULATION:

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Cast-in-place concrete (Section 03 30 00).
2. Flexible insulation (Section 07 21 10).
3. Roof insulation (Section 07 54 00).
4. Fire stopping (Section 07 84 00).

B. Work Included This Section:

1. Extruded polystyrene insulation board.
2. Adhesive, tape, mastic, fasteners and all other supplementary materials required for a complete and proper installation.

1.3 INDUSTRY STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

American Society for Testing Materials International (ASTM)

1.4 SUBMITTALS:

A. Manufacturer's Data: Submit (in duplicate) manufacturer's printed information giving physical data, technical data, installation instructions and other data on insulation and adhesive or other required fasteners.

1.5 PRODUCT HANDLING:

A. Delivery of Materials: Materials shall be delivered to the Project Site in manufacturer's original, unopened packages with manufacturer's brand name clearly marked thereon.

B. Handle and store in accordance with the insulation manufacturer's written instructions.

PART 2: PRODUCTS

2.1 MATERIALS:

A. Rigid Insulation:

1. Material: Shall be Rigid Styrofoam Insulation by Dow Chemical Company, Formular 250 Extruded Polystyrene by UC Industries, Amofoam by Amoco Foam Products Company, or approved equal, extruded polystyrene insulation board conforming to ASTM C 578, Type IV, with the following physical properties:

(a) Density - 1.6 lbs. per cu. ft. minimum.

(b) Compressive Strength - 25 psi minimum.

(c) Water Vapor Permeability - 1.1 perm inch maximum.

(d) "R" Factor - Thermal Resistance (5-year aged value).
Mean temperature 75^{o} F. - 5.0 minimum
Mean temperature 40^{o} F. - 5.4 minimum

2. Insulation shall be thickness shown on the Drawings and if not shown on the Drawings shall be 2” thick.

PART 3: EXECUTION

3.1 COORDINATION WITH WORK OF OTHER TRADES:

A. Coordinate installation of rigid insulation with related work specified in other Sections of these Specifications.

B. Work of other trades to be concealed by or passed through insulation shall be completed and tested before work under this Section is started in any area.

3.2 INSPECTION AND PREPARATION:

A. Require installer to examine substrates and conditions under which insulation work is to be performed. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

B. Clean substrates of substances harmful to insulation including removal of projections which might prevent proper placement of insulation.

3.3 INSTALLATION, GENERAL:

A. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.

B. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

3.4 PERIMETER AND UNDER-SLAB INSULATION:

A. On vertical surfaces, set units in adhesive applied in accordance with manufacturer's instructions. Use type of adhesive specified and as recommended by manufacturer of insulation.

B. Protect insulation on vertical surfaces from damage during backfilling.

C. Protect top surface of horizontal insulation from damage during concrete work and subsequent work by others.

3.5 CONDITION OF SURFACES:

A. All surfaces to receive rigid insulation shall be free of projections to provide maximum contact between the substrate and the insulation board.

3.6 PROTECTION:

A. General: Protect installed insulation from harmful weather exposures and from possible physical abuses, where possible by non-delayed installation of concealing work or, where that is not possible, by temporary covering or enclosure. Damaged work shall be replaced at no additional cost to the Owner.

END OF SECTION 07 20 00

SECTION 07 21 10
FLEXIBLE INSULATION

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Roofing insulation (Section 07 54 00)
2. Rigid insulation (Section 07 21 30).
3. Fire stopping (Section 07 84 00).
4. GWB work (Section 09 29 00).

B. Work Included This Section:

1. Thermal fiberglass batt insulation.
2. Sound attenuation blankets.
3. All supplementary materials and accessories required for a complete and proper installation.

1.3 SUBMITTALS:

A. Manufacturer's Literature and Installation Instructions: Submit manufacturer's literature completely describing each type of insulation and including thermal resistances and acoustical ratings for the various thicknesses indicated to be installed in this Project. Also submit manufacturer's written installation instructions for each type of installation required on this Project.

PART 2: PRODUCTS

2.1 MATERIALS:

A. Flexible Batt Insulation:

1. Insulation shall be fiberglass type as manufactured by Owens-Corning Fiberglass Corp., Certain-Teed Products Corp., Manville Corp., or equal approved in writing by the Architect. Insulation shall have vapor-barrier on one side of aluminum foil at all exterior walls and at ceilings. Any thermal batts shown in interior partitions shall be unfaced.

2. Foil faced insulation shall comply with ASTM C 665, Type III, Class B. Unfaced insulation shall comply with ASTM C 665, Type I.

3. Provide thickness of thermal insulation as shown on Drawings. Insulation shall provide the following minimum thermal resistance ratings (R-values) for the various thicknesses listed.

3 1/2" thick	R-11
3 5/8" thick	R-13
6" thick	R-19
9" thick	R-30

4. Insulation to be installed in metal stud construction shall be "full width" (16" or 24"). Do not use residential width (15" or 23") in metal stud walls.

B. Sound Attenuation Blankets shall be Thermafiber Sound Attenuation Blankets by United States Gypsum Company, unfaced, semi-rigid spun mineral fiber blankets, thickness shown on the Drawings and if not shown 3" thick, Noise Barrier Batt Insulation by Owens-Corning Fiberglass Corp., Fiber Glass Sound Control Batts by Manville Corp. or approved equal.

C. Installation Accessories: Impaling clips, adhesives, tape and other required accessories shall either be furnished by or a type recommended in writing by the insulation manufacturer.

PART 3: EXECUTION

3.1 LOCATIONS: Install insulation at locations shown on Drawings.

3.2 INSTALLATION:

A. Install faced insulation with vapor barrier facing toward the interior of the building.

B. Follow written recommendations of the manufacturer of insulation and of fasteners for method of attaching insulation. In addition to the manufacturer's recommendations, comply with the following procedure to prevent insulation in walls from sagging and leaving an uninsulated space at top of the wall: Lap edges of insulation over metal studs. Tape the first lap to the metal stud and tape the second lap to the first lap.

C. Butt ends and edges of insulation batts together and tape for a continuous sealed installation. Split and cut insulation to fit around pipe, boxes, etc. Where possible, make continuous behind such objects by overlapping insulation.

D. Provide impaling clips, wire lattice or UL approved plastic netting to support insulation in vertical or horizontal position if necessary to prevent tearing or sagging. Also comply with requirement specified in Paragraph 3.2 b. above to prevent insulation in walls from sagging and leaving an uninsulated space at top of the wall.

END OF SECTION 07 21 10

SECTION 07 54 00
FULLY ADHERED THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Rough carpentry including wood curbs and nailers (Section 06 10 00).
2. Flashing and sheet metal (Section 07 62 00).
3. Sealants (Section 07 92 00).
4. Mechanical and electrical equipment located on roof (Divisions 23 & 26).

B. Work Included This Section:

1. Fully adhered TPO membrane roofing system in strict accordance with Drawings and Specifications, approved shop drawings and manufacturer's published instructions.

2. Installation of membrane, insulation and all required flashing and other accessories, any incidental work necessitated by these operations and such other related work as may be called for by the Drawings, these Specifications or required for a watertight and complete and proper installation; and as required to issue the specified warranties.

3. Roofing components will be required to be acceptable by Factory Mutual for installation over concrete deck roof construction and complying with Loss Prevention Data Sheet 1-29, latest edition.

4. Roofing system will be required to be approved for use in an Underwriter's Laboratory Inc., Class A roof covering system.

5. Roof drains will be furnished to the roofing subcontractor by the plumber and shall be installed by the roofer as part of the work of this section. Connection to the roof drains and pipe leaders will be by the plumber.

6. Provide flashing at all penetrations to the roof, including around mechanical equipment.

1.3 INDUSTRY STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

The American Society for Testing and Materials (ASTM)
Underwriter's Laboratories Inc. (UL)
Factory Mutual (FM)

1.4 EXISTING CONDITIONS:

A. There are three separate and distinct roof areas/levels involved with the project. The upper roof (22'x32') is comprised of fully-adhered .060 white TPO over tapered polyisocyanurate insulation (min 1" thick) installed over the original tapered "All-Weathercrete" on a structural concrete deck. The two larger roof (Main floor and 8th floor) areas are comprised of 0.060 white TPO over 1" polyisocyanurate insulation over the original gravel surface built-up roof over tapered "All-Weathercrete" on structural concrete deck. The overall thickness of any of the three roof areas varies from 2"-6" above the structural concrete deck. The overall area of the three roofs is approximately 24,850 sf.

1.5 SUBMITTALS:

A. Warranty:

1. The General Contractor shall warrant the roofing system to conform to requirements of the Contract Documents. He shall further guarantee to repair the roofing system in the event of leaks or other failure of any part of the roofing system and to repair or replace damage to the interior of the building resulting from failure of the roofing system for a period of 2 years from date of final acceptance. Warranty shall be submitted on a copy of the form "Roofing Warranty" included under the contract Forms part of this Project Manual.

2. The roofing membrane manufacturer shall issue a single source warranty upon completion of the Project. This warranty shall guarantee the watertight condition of the roof system for a period not less than 15 years from date of final acceptance.

B. Manufacturer's Literature:

1. Furnish manufacturer's literature on all roofing materials specified for approval by the Architect.

2. Furnish manufacturer's printed installation instructions and diagrams.

C. Shop Drawings: Shop drawings shall be submitted by the Contractor.

1. Shop drawings shall include outline of roof and roof size, location and type of penetrations, perimeter and penetration details, special details, termination details and relation to adjacent construction, and bill of material. Shop drawings shall show layout of tapered insulation and the resulting percentage of slope to the roof drain in each roof area.

2. Include layout drawings showing locations of all seams in the membrane for the Architect's approval.

3. Include uplift pressure calculations and perimeter and corner attachment requirements per FM LPDS 1-29.

D. Letter from Membrane Manufacturer's Warranty Department:

1. Submit a letter from the roofing membrane manufacturer's Warranty Department that states:

a. All Contract Documents relating to the roof system have been reviewed.

b. All materials are physically and chemically compatible with each other and the system, as designed, is suitable for the specified warranty.

c. Roof system has been designed for a 90-mph wind zone.

d. Manufacturer has reviewed the system for a warrantied wind speed of 90 mph.

e. The Roofing Contractor is an applicator approved by the roof membrane manufacturer.

f. Statement verifying that all materials, from the roof deck up are covered in the warranty.

g. Name of Owner and name and location of Project.

E. Punchlist Report: Copy of roofing system's manufacturer's punchlist after pre-final inspection of roofing system.

F. Final Inspection Report: Copy of roofing system manufacturer's inspection report at the time of inspection of completed roofing installation.

1.6 PRODUCT HANDLING:

A. Deliver materials in original unopened containers.

B. Containers shall be labeled with manufacturer's name, brand name, installation instructions and identification of various items.

C. Store materials between 60 degrees F. and 80 degrees F. If exposed to lower temperatures, restore to proper temperature before using.

D. Store materials in a dry area and protect them. Damaged materials shall be replaced at Contractor's expense.

1.7 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

C. Roofing System Design: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to FM I-29.

D. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.

E. Roofing System shall comply with the following:

1. Fire/ Windstorm Classification FM I-90
2. FM I-49 Loss Prevention Data Sheet for Perimeter Flashing.
3. FM I-28 Loss Prevention Data Sheet for Windloads to Roof Systems and Roof Deck Securement.
4. FM I-29 Loss Prevention Data Sheet Above Deck Roof Components (2006)
5. NRCA Manual for Low Slope Roofing Construction Details (latest edition)
6. SMACNA Manual (latest edition)

1.8 JOB CONDITIONS (Cautions and Warnings):

A. Do not use oil base or plastic roof cement.

B. Do not allow waste products (petroleum, grease, oil, solvents, vegetable or mineral oil, animal fat or direct stem venting) to come in contact with the finished roofing system or the rubber membrane at any time.

C. Do not expose membrane or accessories to a constant temperature in excess of 180 degrees F.

D. Cements and bonding adhesives can contain petroleum distillates and are extremely flammable. Do not breathe vapors or use near fire.

E. Heptane, unleaded or white gasoline used in splicing procedures are extremely flammable; do not use near fire or flame or in a confined or unventilated area. Dispense only from a UL tested or approved safety can.

F. Splicing, and bonding surfaces shall be clean and dry.

G. Cold temperatures will not restrict installation of the roofing system. Follow specified precautions for storage of materials and expose only enough cement and adhesive to be used within a 4-hour period.

H. Roof surface shall be free of ponded water, ice or snow to eliminate future condensation problems.

1.9 PROTECTION:

A. Building walls shall be protected adequately from soil or spillage at all points. Contractor shall be responsible to prevent damage to building from his operations. Any such damage shall be repaired at his expense to the Architect's satisfaction or to restore to original condition. Coordinate the installation of roof accessories and roof mounted equipment. Provide necessary protection to roof system during installation of roof mounted equipment.

1.10 PRE-INSTALLATION ROOFING MEETING:

A. Approximately one week prior to commencement of work, Contractor is to schedule a pre-installation meeting.

B. Meet at the site with roofing installer, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work in and around roofing that must precede or follow roofing work (including mechanical work if any), Architect, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of the work, including (where applicable) Owner's insurers, test agencies, and governing authorities.

C. Contractor is to conduct the meeting with input from Architect and Consultants.

D. During the course of the meeting review the following:

1. Foreseeable methods and procedures related to roofing work, including but not necessarily limited to the following:

2. Structural loading limitations of steel deck, concrete deck and inspect deck for loss of flatness and for required mechanical fastening.

3. Roofing system requirements (drawings, specifications, and other contract documents).

4. Required submittals, both completed and yet to be completed.

5. Finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

6. Required inspection, testing, certifying, and material usage accounting procedures.

7. Weather and forecasted weather conditions and procedures for coping with unfavorable conditions.

E. Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations, and other preparatory work performed by other trades.

F. Contractor to record discussions of conference, including decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.

G. Contractor to distribute minutes to all parties concerned.

PART 2: PRODUCTS

2.1 MANUFACTURERS:

A. Products of the following manufacturers will be acceptable for use on this Project when the specified submittals are approved in writing by the Architect:

Carlisle Snytec Systems
Firestone Building Products Company
GAF
JP Stevens
Versico Inc.

2.2 MEMBRANE:

A. .060" thick TPO (thermoplastic polyolefin) conforming to the following, or better, physical properties and by one of the manufacturers listed herein before, or equal approved in writing by the Architect.

Property	Test Method	Specification
Color		White
Breaking Strength	ASTM D751	225 lbf
Elongation at Break	ASTM D751	15%
Tearing Strength	ASTM D751	55lbf
Brittleness Point		Minus 22 deg F
Ozone resistance	ASTM D1149	No Cracks 7 days/100

		PPHM/104 deg. F./50%
Resistance to Heat Aging	ASTM 573	90% minimum retention of breaking strength, elongation at break, and tearing strength 7 days at 240 deg F.
Water Absorption	ASTM D471	less than 4% 7 days immersion at 158 deg F.

2.3 RELATED MATERIALS:

A. Flashing: Manufacturer's standard unreinforced TPO, 060" thick same color as sheet membrane.

B. Bonding Adhesive: Compatible with materials to which the membrane is to be bonded. Furnished by membrane manufacturer.

C. Splicing Cement: Furnished by membrane manufacturer.

D. Splice Cleaner: Furnished by membrane manufacturer.

E. Lap Sealant: Compatible with materials with which it is to be used; shall be trowel or gun consistency. Furnished by membrane manufacturer.

F. Water Cutoff Mastic: Compatible with materials with which it is to be used. Furnished by membrane manufacturer.

G. Molded Pipe Flashing: Compatible with materials with which it is to be used. Furnished by membrane manufacturer.

H. Night Seal: Compatible with materials with which it is to be used. Furnished by membrane manufacturer.

I. Pourable Sealer: Compatible with materials with which it is to be used. Furnished by membrane manufacturer.

J. Prefabricated Pipe Boots: Are provided as alternative to .055-in. unsupported flashing for vent stacks and pipes 2-in. to 5-in.

K. Prefabricated Corners: Are provided as an alternative to .055-in. unsupported flashing for use and outside and inside corners.

L. Flat and Tapered Roofing Insulation:

1. Flat and tapered polyisocyanurate roof insulation, which contains zero-HCFC's and have zero ozone depletion potential for thermal protection as part of roofing assemblies. Insulation shall comply with the following:

a. ASTM 1289-01 Type II, Class 1, Grade 2.

b. Minimum Long Term Thermal Resistance as listed on Code Summary Sheet.

c. Blowing agent: HCFC-free.

d. Fire ratings: UL 1256, No. 120 and 123.
FM 4450/ 4470, Class 1.

e. Compressive strength: 20 pounds per square inch.

f. Contractor is to verify that the insulation facers are suitable for adhering the insulation to the roof deck and for adhering the roofing membrane to the insulation such that the specified UL and FM criteria are provided, before purchasing and using the insulation.

g. Minimum two layers of insulation required.

M. Walkway Pads: Factory-molded, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway rolls, approximately 3/16-inch-thick, provided by the membrane roofing system manufacture.

N. Overlayment / Cover Board: Georgia Pacific Dens deck prime, 4SG Securock, Thermco Gypsum Dens deck or approval equal.

O. Metal termination bars: Shall be manufactures standard with top edge reveal for sealant application.

PART 3: EXECUTION

3.1 GENERAL: Installation shall be in strict accordance with the manufacturer's printed instructions. Prior to beginning work, an inspection of the roof substrate shall be made by the Owner, Architect, General Contractor, manufacturer and roofing subcontractor. Beginning of roofing work shall constitute acceptance of existing conditions by the manufacturer and roofing subcontractor. Roofing subcontractor and/ or manufacturer shall notify Contractor in writing of defects in the substrate and work shall not proceed until defects have been corrected.

A. Substrates shall be clean, smooth, free of fins, sharp edges, loose and foreign materials, oil, grease and fresh roof cement.

B. Surface joints (including walls and substrates) shall be 1/4" or less in width. Repair all joints wider than 1/4" with an approved sealant before proceeding with installation.

3.2 INSTALLATION OF INSULATION:

A. Coordinate installing membrane roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Install insulation in strict accordance with the manufacturer’s published instructions.

C. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof in accordance with UL and FM LPDS 1-29.

D. Insulation shall be neatly fitted to all penetrations, projections, and nailers. All gaps greater than 1/4" wide shall be filled with sealant approved by the membrane manufacturer. Under no circumstances will be membrane be left unsupported in an area greater than 1/4". Tapered or feathered insulation shall be installed around roof drains and scuppers in such a way as to provide proper slope for drainage.

E. No more insulation shall be installed than can be covered with roofing membrane and completed before the end of the days work or before the onset of inclement weather.

F. All other insulation boards are to be mechanically fastened to the deck using fasteners specifically designed and sized for fastening insulation to steel deck.

G. Both adhering and fastening installations shall be in accordance with the manufacturer's written recommendations and such as to ensure that the specified UL and FM criteria are provided.

H. Install overlayment board, thickness as required, in accordance with the manufacturer's written recommendations and such as to ensure that the specified UL and FM criteria are provided.

3.3 INSTALLATION OF MEMBRANE:

A. Install roofing membrane over area to receive roofing according to membrane manufacturer’s published instructions. Unroll roofing membrane and allow to relax before installing.

B. Start roofing membrane installation in the presence of membrane roofing system’s manufacturer’s technical personnel.

C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Apply solvent-based bonding adhesive to substrate at rate required by manufacturer and immediately install roofing membrane. Do not apply bonding adhesive to splice area of roof membrane.

E. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter roofing.

F. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

G. Clean seam areas overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer’s written instructions to ensure watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.

H. Flashing: Perimeter flashing and flashing around vents, etc., shall be done with flashing approved by the membrane manufacturer using the longest pieces practicable. All flashings and terminations shall be done in accordance with the membrane manufacturer's standard details.

I. Expansion Joints: Expansion joints shall be flashed in accordance with the membrane manufacturer's standard details.

J. Night Seal: Care shall be exercised to ensure that the water does not flow beneath any completed sections of roof. Temporarily seal any loose edge of membrane with an approved night seal when weather is threatening.

3.4 CLEAN-UP:

A. Upon completion of installation of roofing system, remove all debris from the job site.

END OF SECTION 07 54 00

SECTION 07 62 00
FLASHING AND SHEET METAL

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Fully adhered membrane roofing and insulation (section 07 54 00)

B. Work Included This Section:

1. Furnish and install general sheet metal flashing, gravel stop, and fascia, counterflashing and other types of flashing as shown on Drawings, as specified herein and as required for watertight construction.

1.3 INDUSTRY STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

The American Society for Testing and Materials (ASTM)
Federal Specifications (FS)
Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

1.4 SUBMITTALS:

A. Shop Drawings: Shall be submitted describing materials, details and installation of the roofing system. Shop drawings shall be reviewed and approved by the General Contractor and the manufacturer prior to submittal to the Designer.

PART 2: PRODUCTS

2.1 MATERIALS:

A. Sheet Metal for General Sheet Metal Work: Use the thicknesses or gauges listed below unless shown otherwise on the Drawings. Unless a particular type of metal is noted on the Drawings or specified, the Contractor will have the option to select from the types listed below.

1. Copper: Light cold rolled tempered 16 oz. (0.021" thick) sheet copper conforming to ASTM B 370.

2. Aluminum: ASTM B 209, alloy 3003, tempered, .032" thick unless specified or indicated to be thicker.

3. Stainless Steel: AISI Type 302/304, ASTM A 167, 2D annealed finish, soft except where harder temper required for forming or performance; 0.015" thick (28 gauge) except as otherwise indicated.

4. Treated Sheet Metal: Bonderized, galvanized sheet steel, minimum 22 gauge, Zincgrip-Paintgrip as manufactured by Armco Steel Corp.

5. Lead-Coated Copper: Copper sheet to comply with ASTM B 370, 16 oz. (0.021" thick) with lead coating of 0.06 lbs. per side per sq. ft. on both sides of the copper sheet. Lead coated copper sheet to comply with ASTM B 101, Type 1, Class A.

B. Solder: Containing at least 50% tin.

C. Nails: Flat head, bronze, brass or copper with copper sheet, zinc coated with galvanized sheet.

D. Flux for Soldering: As recommended by manufacturer of sheet metal.

E. Powder-Actuated Fasteners: Corrosion-resistant fasteners, sized as recommended by manufacturer for specific function and substrate.

F. Caulking Compound: Urethane or silicone sealant approved for use in Section 07 90 00 for the particular application.

G. Mastic: Shall be waterproof, non-sagging type as recommended by the manufacturer for the use intended.

H. Rubber Sheet: Shall be 1/16" thick neoprene or butyl sheet.

2.2 COUNTERFLASHING:

A. Two-piece aluminum type consisting of reglet part and snap-in counterflashing part, such as Springlok Type A by Fry Reglet Corporation.

2.3 REGLET:

A. Where roofing membrane or elastomeric flashing turns up vertical surface of masonry or concrete, terminate the membrane in a factory manufactured stainless steel reglet and counterflashing of 0.015" minimum thickness. Provide size and profile shown and if not shown as required by construction conditions. Reglet and counterflashing shall be manufactured by Fry Reglet Corp., Cheney Flashing Co. Keystone Flashing Co., or equal approved in writing by the Architect.

PART 3: EXECUTION

3.1 GENERAL REQUIREMENTS FOR METAL FLASHING AND TRIM:

A. Sheet metal shall be watertight with provisions for expansion and contraction.

B. Paint all sheet metal surfaces which will be in contact with roofing, concrete or mortar with bituminous paint. Similarly paint dissimilar metal in contact with one another to prevent galvanic action.

C. Sheet metal work shall conform to requirements of Sheet Metal and Air Conditioning Contractors National Association Inc. (SMACNA) Architectural Sheet Metal Manual, Washington, DC, latest edition. Copper flashing shall conform to the design principle and techniques of sheet copper construction set forth in the latest edition of "Copper and Common Sense" by Revere Copper and Brass Inc.

D. Corners of copings gravel stop/ fascia shall be factory mitered and welded prior to finishing. Form and fabricate in shop.

E. Fabricate flashing and trim to the profile shown in 8'-0" lengths or longer except where shorter lengths are required by construction or sheet size. All exposed edges shall be turned under for stiffness; no exposed sheared or raw edges shall be permitted.

F. Seams shall be neatly finished with true sharp lines free of oil can buckles. Flat seams shall not be less than 1/2" wide single locked and solder sweated or double locked and malleted flat or as shown on the Drawings.

G. Expansion joints shall be made with splice plates single locked.

H. All work shall be of the highest quality performed by workmen skilled in this trade. The work involved shall be completely waterproof and shall not invalidate any required bonds and guarantees.

I. After completion, all exposed work shall be thoroughly cleaned of all scraps, stains and dirt. After cleaning, the metal shall be washed with clean water and wiped dry. Flux shall be removed and excess neutralized to prevent staining.

3.2 REGLETS:

A. Install flush with embedded construction in continuous level horizontal lines. Install in maximum lengths available. Paint reglets surfaces in contact with concrete or mortar with bituminous paint. Set securely in concrete and masonry construction.

B. Install cap flashing piece by lapping adjacent piece 3" minimum and applying concealed sealant bead at each lap. Lock in place against bituminous material under full tension.

END OF SECTION 07 62 00

SECTION 07 81 10
SPRAYED-ON FIREPROOFING

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Structural Steel Existing.
2. Open Web Joists Existing.
3. Metal Decking Existing.
4. Firestopping (Section 07 84 00).

B. Work Included This Section:

1. Sprayed-on fireproofing as shown on the Drawings and as specified. Include all supplementary materials required for a complete and proper installation.

1.3 QUALITY ASSURANCE:

A. Installer of Sprayed-On Fireproofing: A firm licensed or otherwise approved by manufacturer of primary fireproofing materials, including qualified factory training where recommended by manufacturer.

B. Fire-Endurance Ratings: Provide products which have been tested in accordance with ASTM E 119 (or UL 263, ANSI A2.1 or NFPA 251) for fire resistance and rated by UL or other industry-recognized agency for the required resistance.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's product literature, specifications and installation instructions for each type of material and application method required.

B. Certified Tests: Submit certified test reports from an independent testing laboratory substantiating compliance with indicated and specified requirements.

1.5 SEQUENCING AND COORDINATION:

A. General: Integrate the scheduling/coordination of fireproofing work with other units of work so that it will not be exposed to weather and other damaging ambient conditions, will not be unnecessarily exposed to abrasion and other damage likely to occur during subsequent work, will be installed prior to installation of enclosing or concealing work, will provide time allowance for inspection/testing and subsequent correction of defective fireproofing, and will minimize time other work to be protected by fireproofing is exposed to possible fire hazards.

1.6 WARRANTY:

A. Submit written warranty, executed by Contractor and co-signed by Installer, agreeing to repair/replace fireproofing work of this Section, which has cracked, flaked, dusted excessively, peeled or fallen from substrate, or otherwise deteriorated to a condition where it would not perform effectively as intended for fireproofing purposes; due substantially to defective materials or workmanship and not due to abuse by occupants, improper

maintenance, nonforseeable ambient exposure, or other causes beyond anticipated conditions and Contractor's/installer's control.

B. Warranty period is 2 years after date of substantial completion.

PART 2: PRODUCTS

2.1 SPRAYED-ON FIREPROOFING MATERIALS:

A. General: At locations indicated on the Drawings and as specified herein, provide sprayed-on fireproofing complying with requirements specified and indicated.

B. Products: Subject to compliance with the Drawings and Specifications, provide one of the following, or equal approved in writing by the Architect. Gypsum based products are not acceptable.

1. Monokote Type MK-6/HY by W.R. Grace Co.

2. Blaze Shield II by Isolatec International Corp.

3. Pyrolite 15 by Carboline Co.

C. Physical Properties: Minimum values, unless otherwise indicated, measured per standard test methods referenced with each property, as follows:

1. Bond Strength: 300 lbs. per sq. ft. (minimum) per ASTM E 736.

2. Compressive Strength: Shall not deform more than 10% when subjected to compressive force of 1400 psf and tested in accordance with ASTM E 761.

3. Corrosion Resistance: No evidence of corrosion per ASTM E 937.

4. Deflection: No cracking, spalling, delamination or the like per ASTM E 759.

5. Effect of Impact on Bonding: No cracking, spalling, delamination or the like per ASTM E 760.

6. Air Erosion: Maximum weight loss of 0.005 grams per sq. ft. per ASTM E 859

7. Dry Density: Values for average and individual densities as required for fire-resistance rating indicated, per ASTM E 605, but not less than the following minimum average density: 15 lb per cu. ft.

8. Surface Burning Characteristics: Maximum flame spread, and smoke developed values of 0 and 0, respectively per ASTM E 84.

2.2 AUXILIARY FIREPROOFING MATERIALS:

A. Substrate Primers: Provide type which is compatible with condition of each substrate to be fireproofed, including shop primers applied by metal fabricators/erectors, and which is recommended by fireproofing materials manufacturers for (in each case) compatibility with bonding adhesives and fireproofing materials.

B. Adhesive for Bonding Fireproofing: Type recommended by fireproofing manufacturer and complying with selection requirements of applicable fire-endurance tests.

C. Hardcoat Topping: Fireproofing manufacturer's recommended standard high-density cementitious finish coat for 1/8" thick minimum application, compounded to provide

increased surface hardness and improved weather resistance of fireproofing. Use this material only if necessary in order to meet material and guarantee requirements specified.

2.3 REQUIRED LOCATIONS AND FIRE RATINGS:

A. Refer to Building Code Summary for additional fireproofing information. Where Room/ Color Finish Schedule and Reflected Ceiling, plans indicate sprayed-on fireproofing for exposed ceilings, all steel members shall receive adequate fireproofing to provide the required ratings.

PART 3: EXECUTION

3.1 INSPECTION AND PREPARATION:

A. Installer shall examine substrates and conditions under which fireproofing work is to be performed and notify Contractor in writing of unsatisfactory conditions. Do not proceed with fireproofing work until unsatisfactory conditions have been corrected in a manner acceptable to Installer. Installation of fireproofing shall signify acceptance of the substrate by the Installer as acceptable for his product.

B. Clean substrates which might be incompatible with or interfere with bond of fireproofing, including oil, dirt, scale, rust and non-compatible shop primer. Remove ill-timed work which might interfere with installation of fireproofing.

C. Prime substrates where recommended by fireproofing manufacturer, covering surfaces to receive direct-bonded application of fireproofing, except where acceptable shop primer (specified as work of another Section) is in satisfactory condition to receive fireproofing, as determined by Installer.

D. Cover other work which might be damaged by fall-out or over-spray of fireproofing materials during spraying operations. Provide temporary enclosure as may be required to confine operations, protect the environment, and ensure adequate ambient conditions, including temperature minimum of 55 degrees F. Maintain substrate temperatures of at least 40 degrees F.

3.2 INSTALLATION:

A. General:

1. Comply with manufacturer's instructions for particular conditions of installation in each case. Consult with manufacturer's technical representative for conditions not covered by printed instructions.

2. Coat substrate with bonding adhesive where direct bonding of fireproofing is indicated and where use of adhesive is required or recommended by manufacturer.

3. Provide thicknesses and densities as required to provide the fire ratings specified herein and shown on the Drawings. Extend fireproofing full thickness over entire area of each substrate to be protected. Except as otherwise indicated or recommended by manufacturer, install body of fireproof covering material in a single course.

4. Provide sprayed-in-place installation of fireproofing materials to the greatest extent possible. Following spraying operation in each area, complete the coverage by troweled installation or other appropriate placement method recommended by manufacturer.

5. Maintain ambient conditions during installation and for cure period following installation, as recommended by manufacturer. Provide ventilation and avoid excessive rate of drying. Protect from exposure to sun.

B. Application:

1. Prior to application of fireproofing, clips, hangers, support sleeves and other attachments required to penetrate the fireproofing shall be in place.

2. Ducts, piping, equipment or other suspended matter which would interfere with application of fireproofing materials shall not be positioned until fireproofing work is complete.

3. Provide masking, drop cloths or other satisfactory coverings so as to prevent overspray of sprayed fireproofing.

4. Application of sprayed fireproofing shall not begin until the General Contractor and the Installer have inspected the surfaces to receive fireproofing to determine if surfaces are acceptable to receive the fireproofing material. Application of fireproofing signifies acceptance of the substrate by the Installer as acceptable to receive his product.

3.3 CLEANING, PATCHING, PROTECTION:

A. Cleaning: Immediately upon completion of spraying operations in each area of Project, remove over-spray and fall-out of materials from surfaces of the work, and clean surfaces to remove evidence of soiling. Repair or replace damaged work to restore surfaces to acceptable condition. Walls, floors and other surfaces are to be left in a scraped clean condition.

B. Coordinate installation of fireproofing with other work so as to minimize the need for other trades to cut into or remove installed fireproofing. As other trades successively complete installations of other work, patch fireproofing installations which have been cut away to facilitate such installations, so as to maintain complete coverages of full thickness on substrates to be protected with fireproofing. Trowel-applied fireproofing materials are acceptable for patching of work. Do not allow work requiring patching to be covered over or otherwise concealed before patching is completed.

C. Protection: Installer of sprayed-on fireproofing shall advise Contractor of protection requirements for fireproofing work, which will ensure that fireproofing will be substantially without damage or deterioration at time of substantial completion of Project. Provide protection from reasonably predictable harmful exposures. Repair or replace work which has not been successfully protected.

3.4 FIELD QUALITY CONTROL:

A. The Owner will engage a qualified independent testing laboratory to inspect the installed sprayed-on-fireproofing and to perform tests and prepare test reports. Coordination of the testing is the responsibility of the Contractor.

B. The testing laboratory will conduct and interpret tests and will state in each report whether the fireproofing complies with the specified and indicated requirements.

C. The testing laboratory will initially test 10% of the fireproofing installed. Fireproofing that fails to comply shall be corrected by the Contractor and will be retested at the Contractor's expense as required to ensure compliance.

D. The Contractor shall provide access for the testing laboratory representative where the fireproofing has been installed so that the required inspection and testing can be accomplished.

E. Correct all deficiencies in fireproofing work which inspections and laboratory test reports indicate are not in compliance with the specified or indicated requirements at no additional cost to the Owner. Additional testing as required for inspection of corrected work shall be at the Contractor's expense.

END OF SECTION 07 81 10

SECTION 07 84 00
FIRE STOPPING

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 DESCRIPTION:

A. Related Work Specified Elsewhere:

1. Sprayed-on fireproofing (Section 07 81 10).
2. Flexible insulation (Section 07 21 10).
3. Rigid insulation (Section 07 20 00).
4. Non-fire-rated sealant work (Section 07 90 00).
5. Fire stopping for plumbing, HVAC, electrical and electronic security (Sections of Divisions 22 thru 28).

B. Work Included This Section:

1. Fire stopping systems in penetrations and other openings through fire rated walls/ceilings/floors, between tops of fire rated walls and structures above, and other locations shown or specified or required by State Building Codes, Building Inspectors, or other authorities having jurisdiction.

1.3 QUALITY ASSURANCE:

A. Reference Standards:

1. ASTM E 814 Fire Test of Through-Penetration Fire Stops.
2. UL 1479 Fire Test of Through-Penetration Fire Stops.
3. UL Fire Resistance Directory.
4. Factory Mutual Approval Guide
5. ASTM E119 Fire Tests of Building Construction and Materials.
6. ASTM C612 Specification for Mineral Fiber Block and Board Thermal Insulation.
7. North Carolina State Building Code.
8. NFPA 101-Life Safety Code.
9. NFPA 70-National Electrical Code.
10. Other agencies or jurisdictional authorities which publish design performance or design evaluation services, such as CABO, BOCA, ICBO, SBCCI, Warnock Hersey, SwRI.

B. Firestopping Subcontractor:

1. The Contractor shall utilize the services of a Firestopping Subcontractor that has attended training school by the manufacturer of the fire stopping materials to be used and has a minimum of three years experience installing UL Classified fire stopping systems.

    a. Furnish Architect with a list of past projects completed prior to starting work.

    b. Submit certificate of attendance of training school.

1.4 SUBMITTALS:

A. The Contractor shall submit manufacturer's descriptive product data sheets for each product proposed to be used. Data sheets shall include an illustration of each UL System number required for the Project (or approved testing agency number) and description of installation methods.

B. At completion of project, submit certification that fire stopping has been completed in accordance with requirements of the Contract Documents.

C. The Contractor and the manufacturer of the fire stop products shall establish the sealing method to be used for penetrations and other openings that are not listed in the "UL Fire Resistance Directory" and that occur due to field conditions. A copy of the sealing method shall be sent to authorities having jurisdiction prior to installation of such materials. After approval is received, forward a record copy to the Architect.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials in original, sealed containers or unopened packages, with labels intact and with mixing and application instructions.

B. Store materials in protected area (clean, dry location) in original containers at temperature levels recommended by manufacturer.

C. Follow other written recommendations of the material manufacturer.

1.6 PRE-INSTALLATION MEETING:

A. Prior to installation of any firestopping materials the Contractor, Firestopping Subcontractor, Architect, Owner and other involved subcontractors and material manufacturers or suppliers shall meet at the site.

B. The purpose of the meeting will be to verify that all requirements of the Contract Documents will be complied with and that the facility is ready and in proper condition to receive the firestopping.

C. No firestopping is to be installed until it is assured that firestopping can and will be installed in accordance with the Contract Documents.

PART 2: PRODUCTS

2.1 MATERIALS:

A. Fire Safing Insulation:

1. Provide Thermafiber Safing Insulation by U. S. Gypsum Company, Rockwool Safing Insulation by Owens-Corning Fiberglas Corp., or equal approved in writing by the Architect, 4 lbs. per cu. ft. density, widths, lengths and thicknesses required for the required fire rating. Include galvanized steel impaling clips, containment devices, and other installation accessories necessary to provide the required fire ratings. Insulation shall meet the requirements of ASTM C 612, Class 1 and 2.

2. Fire Safing insulation shall have the following properties:

a. Fire resistance rating: Not less than the fire rating of the construction penetrated.

b. Flame Spread: 15 (ASTM E 84).

c. Smoke Development: 50 (ASTM E 84).

B. Fire Stopping Systems/Acceptable Manufacturers:

1. Subject to compliance with the Drawings and Specifications and approval by the Architect of the required submittals, firestopping products by the following manufacturers will be acceptable for the Project.

3M Company
General Electric Company
Tremco Inc.
Hilti Construction Chemicals Inc.

C. Fire Resistance Ratings: Not less than the fire rating of the construction penetrated. Provide ASTM E814 (ANSI/UL 1479) F, T and L Ratings as required by reference standards, codes and authorities specified in this Section or indicated on the Drawings for each particular firestopping condition occurring on this Project.

D. Containment Materials and Other Accessory Materials:

1. Include all containment devices and materials and other accessory materials necessary in order that the installed fire safing and stopping will provide the required fire rating and will comply with the applicable UL assembly and requirements of authorities having jurisdiction.

PART 3: EXECUTION

3.1 LOCATIONS: Install fire safing and fire stopping materials as shown on Drawings and specified herein and as required by State Building Codes, Building Inspectors and other authorities having jurisdiction.

3.2 INSTALLATION:

A. Use fire safing insulation in conjunction with fire stopping materials as necessary to provide the required fire ratings and to comply with applicable UL tested systems, State Building Codes, Building Inspectors and other authorities having jurisdiction.

B. The information included in these Specifications and on the Drawings is intended to provide general direction to the Contractor. All penetrations and openings are not detailed as to the UL or other fire stop system sealing method. The fire stopping sub-contractor shall provide the proper sealing method and supporting documentation for all penetrations in any fire or smoke rated wall, ceiling or floor assembly.

C. All materials shall be installed exactly as detailed in the UL system description (or as defined in testing agency details or other details submitted by the Contractor and approved by the Architect).

D. Penetrations of non-fire-rated walls that go to the structure above are not required to be sealed using fire stop materials.

E. Materials shall be applied to openings that are sound, clean, dry, and ready to receive application of fire stopping. All surfaces shall be free of dirt, grease, oil, loose material, or other matter which may affect bond of fire stopping.

F. All holes through concrete (or masonry) or rated drywall partitions shall be cut so as to maintain the annular spacing between the penetrating item and the hole as defined by the UL system or authorized substitution utilized.

G. All penetrations concealed by other construction shall be inspected by the Building Inspections Department before they are concealed. The Contractor shall call for this inspection and receive written sign off before the walls are closed up.

H. At completion of Project, submit certification that all fire stopping has been completed in accordance with code requirements having jurisdiction.

I. The Inspector may require destructive testing of penetration systems. The affected contractor shall repair those penetrations and effected adjacent materials at no additional cost to the Owner.

END OF SECTION 07 84 00

SECTION 07 90 00
SEALANTS

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Architectural precast concrete work -Existing.
2. Unit masonry (Section 04 20 00).
3. Flashing and sheet metal (Section 07 62 00).
4. Fire stopping (Section 07 84 00).
5. Hollow metal frames (Section 08 11 00).
6. Aluminum storefront, and windows (Division 8 Sections).
7. Glazing (Section 08 80 00).

B. Work Included This Section: Caulking and sealant work as shown on Drawings, as specified and as required for a watertight facility. Include all supplementary materials and installation accessories required for a complete and proper installation.

1.3 INDUSTRY STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

American Society for Testing and Materials (ASTM)
American National Standards Institute (ANSI)

1.4 SUBMITTALS:

A. Installation Instructions: Submit duplicate copies of manufacturer's written instructions for installation of sealants specified.

B. Manufacturer's Data: Submit manufacturers printed data for the sealants specified. Data shall show test results of the physical properties of the materials. Submit all data regarding joint design bringing to the Architect's attention any conditions shown on the Drawings under which the specified material cannot be satisfactorily installed.

C. Samples: Submit samples of the full range of manufacturer's colors for selection of project colors by the Architect. As specified in Part 2 of this Section, custom colors may be required at no additional cost to the Owner.

D. Schedule of Colors: Submit schedule showing where selected colors of sealant are to be installed for approval by the Architect.

E. Guarantee-Warranty:

1. Submit guarantee-warranty on products and execution of sealant work required by this Section. Guarantee-warranty shall be submitted on applicator's company letterhead and shall be signed by an officer of the company. Guarantee-warranty shall be countersigned by the General Contractor.

2. Warranty shall state that work complies with requirements of the Contract Documents.

3. Guarantee shall state that work of this Section shall be repaired or replaced in case of failure and that any materials or finishes of the building damaged by failure of work of the Section will be repaired or replaced. The guarantee period shall be 24 months following date of final acceptance. Repair or replacement shall be performed at no additional cost to the Owner.

F. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.

2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

1.5 QUALIFICATIONS:

A. Source: Products for use on this Project shall be of one manufacturer unless noted specifically otherwise herein.

B. Applicators: Submit letter from manufacturer of sealant materials stating that applicator is approved by the manufacturer for application of the materials specified for the Project. Letter shall certify that the applicator has satisfactorily applied the types of materials specified on projects which have been completed for at least 5 years. Letter shall be on manufacturer's letterhead and shall be signed by an officer of the company.

1.6 PRODUCT HANDLING:

A. Delivery of Materials: Materials shall be delivered to the project site in manufacturer's original, unopened containers with manufacturer's brand name clearly marked thereon.

B. Storage: Store containers in dry conditioned space.

1.7 ENVIRONMENTAL CONDITIONS:

A. Do not apply sealant to materials whose surfaces are damp, wet or exceed the temperature requirements stated herein or recommended by the sealant manufacturer.

B. Weather: No sealant materials shall be applied in wet weather nor when the threat of rain exists within 12 hours.

C. Temperature: Shall be 40 degrees F. and rising or above with no chance of freezing until the sealant materials have had a chance to properly set up and dry. No sealant materials shall be applied when the air temperature is below 40 degrees F. unless surfaces are heated and dried by approved means.

PART 2: PRODUCTS

2.1 MATERIALS: Note that the words "Sealant" and "Caulking" are used interchangeably. Comply with locations specified for the various types of materials.

A. Use the following sealants for general sealing and caulking work. See Part 3 of this Section for required locations for the various types of sealants.

1. Urethane Sealant:

a. Compound shall be a multi-component non-sag urethane sealant. Compound shall meet ASTM C 920. Color will be selected by the Architect to match adjacent materials.

b. Compound shall be one of the following, or equal approved in writing by the Architect:

"Sonolastic NP II" as mfd. by Sonneborn-Products

"Dynatrol II" as mfd. by Pecora Corp.

"Dymeric 240/ 240FC" as mfd. by Tremco Manufacturing Co.

"Sikaflex-2C NS" by Sika Corporation

2. Silicone Based Sealant:

a. Compound shall be a one-part, silicon-based sealant compound which meets the requirements of ASTM C 920. Color will be selected by the Architect to match adjacent materials.

b. Compound shall be one of the following, or equal approved in writing by the Architect:

"791 Building Sealant" as mfd. by Dow Corning

"790 Building Sealant" as mfd. by Dow Corning

"795 Building Sealant" as mfd. by Dow Corning

"Silpruf Sealant" as mfd. by General Electric

"890/864 Silicone" as mfd. by Pecora

"Spectrum 2" as mfd. by Tremco

3. Self-Leveling Type Sealant:

a. Compound shall be a two-part polyurethane-based compound which meets the requirements of ASTM C 920. Color will be selected by the Architect.

b. Compound shall be one of the following, or equal approved in writing by the Architect:

"NR 200 Urexpand" as mfd. by Pecora Corporation

"THC/900" as mfd. by the Tremco Manufacturing Company

"Sikaflex-2C SL" by Sika Corporation

"Vulkem 245" by Tremco.

4. Latex Caulking Compound:

a. Caulking shall be an acrylic-latex compound and shall be one of the following, or equal approved in writing by the Architect. Color will be selected by the Architect to match adjacent materials and shall be a custom color at no additional cost to the Owner.

"DAP Latex Caulk" as mfd. by DAP, Inc.

"AC-20 + Latex" as mfd. by Pecora Corp.

"Tremflex 834" as mfd. by Tremco.

B. Primer: Provide primer recommended by sealant manufacturer.

C. Joint Sealant Backing:

1. General: Provide sealant backings of material and type which are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

2. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-waxing, non-extruding strips of flexible, non-gassing plastic material described below, non-absorbent to water or gas, and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

a. Closed-cell polyethylene foam, unless otherwise indicated, subject to approval of sealant manufacturer, for cold-applied sealants only.

3. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26 deg F (-15 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

4. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

PART 3: EXECUTION

3.1 PROJECT INSPECTION:

A. Prior to the application of any sealant compound, a manufacturer's representative shall visit the project site with the Contractor and the Architect and shall instruct the Contractor's applicator in the proper procedures of handling and applying their product to the materials involved. After application, the manufacturer's representative shall inspect the sealant work and shall notify the Architect in writing of his findings.

3.2 LOCATIONS OF SEALANTS:

A. Seal all joints of materials on the exterior of the building and where otherwise shown or required to provide a watertight installation. Seal interior joints as shown and specified.

Install interior sealant and caulking work as shown and specified and in accordance with established standards of the trade.

B. Unless otherwise specifically shown on the Drawings, the following types of caulking and sealant compounds shall be used in the following locations:

1. Interior General Use - Latex Caulking Compound.

2. Exterior General Use Not Specified Otherwise - Urethane Sealant.

3. Exterior Horizontal Pavement Expansion Joints - Self-Leveling Type Urethane Sealant.

4. Vertical or Horizontal Expansion or Control Joints in Walls - Urethane Sealant.

5. Roof Flashing and Trim - Silicone or Urethane Sealant.

6. Aluminum Storefront, and Windows - Silicone Sealant.

7. Metal, Glass and Other Nonporous Surfaces - Silicon Sealant.

8. Masonry, Concrete and Other Porous Surfaces - Urethane Sealant.

9. Vertical or Horizontal Expansion or Control Joints in Masonry or Precast Walls - Urethane Sealant.

3.3 JOINTS:

A. Joint tolerances and design shall be as recommended by the sealant manufacturer. Where joint dimensions and tolerances recommended by the sealant manufacturer are more restrictive than those specified herein, the manufacturer's requirements shall govern.

B. Joints to receive silicone-based sealants shall not be less than 1/4" in width nor greater than 5/8" in width. Sealant shall be installed to a thickness of 1/8" minimum and /8" maximum. Sealant shall be installed so that it adheres and bonds only to the sides of the joint and not to joint backing.

C. Joints to receive urethane-based sealants shall not be less than 1/4" nor more than /4" in width. Joint depth for joint widths up to 1/2" shall be the same as the joint width. For joints over 1/2" wide, joint depth shall be approximately 1/2 the width but not more than 1/2".

D. Joints to receive self-leveling sealant shall not be less than 1/4" wide nor greater than 2". Joints depth shall not be less than 1/4" deep nor greater than 1" deep with full-joint depth filled with sealant.

E. Interior caulking shall be installed only where shown on the Drawings or specified under the various Sections of these Specifications. Caulking of material joints to close construction errors or joints not shown on the Drawings shall be permitted only upon written approval by the Architect.

F. Where shown on the Drawings or called for in the Specifications, latex caulking joints shall not be less than 1/4" nor greater than 1/2" with a depth of 1/2 the face width and with caulking material installed the full depth of the joint.

G. Where joint depth exceeds that specified herein, fill with filler rod specified for specific sealant to provide proper depth.

3.4 PREPARATORY WORK:

A. Clean all joints of all contaminants and impurities. Concrete form release agents, water repellents, concrete laitance, and other surface treatments and protective coatings are examples of materials which must be removed from the joint surfaces to obtain proper sealant adhesion.

B. Porous substrates shall be cleaned where necessary by grinding, saw cutting, blast cleaning (sand or water), mechanical abrading or a combination of these methods as required to provide a sound clean surface for sealant application. Dust, loose particles, etc. shall be blown out of joints with oil-free compressed air or vacuum cleaned.

C. Metal and glass surfaces shall be cleaned by wiping a solvent saturated clean cloth over only those surfaces to which sealant will be applied. A dry, clean cloth shall be used to remove the cleaning solvent from the surface.

D. For plastic, painted and other coated surfaces, the manufacturer shall be consulted to determine the proper cleaning solvent.

E. Greases, protective films and coatings, dust, oil, water, surface dirt and rust are examples of contaminants which must be removed.

F. Cleaning of all surfaces shall be done on the same day in which the sealant is installed.

3.5 PRIMING:

A. In addition to the recommended surface preparation steps, it may be necessary to prime concrete, masonry or other porous surfaces due to the extreme surface variability encountered on a job-to-job basis. If, in the opinion of the sealant manufacturer, joint surfaces are weak or contaminated, he shall recommend a primer for use with his sealant product to be applied on this Project.

B. Apply primer only in accordance with each sealant manufacturer's printed recommendations.

3.6 APPLICATION OF JOINT FILLER:

A. Joints where a backstop has not been provided shall be packed with a joint filler rod to within 1/2" of the surface.

B. Install a breaker-strip of polyethylene film at back of joint where filler rod cannot be used to prevent bond of caulking or sealant compound to back of joint.

3.7 APPLICATION OF SEALANT:

A. Install in strict accordance with manufacturer's printed instructions.

B. Apply sealant compound with gun having proper size nozzle or with knife as required.

C. See requirements of other Sections of these Specifications.

D. Use sufficient pressure to fill all voids and joints solid and to engage compound to sides of joint. A superficial skin or fillet bead will not be acceptable.

E. Remove excess compound and leave surfaces neat, smooth and clean. Joints shall be even and uniform in appearance and shall be watertight. Tool surface to produce good contact, to increase density and to improve appearance. Use masking tape to insure a neat appearance where required; mask only the protected area and remove before sealant begins to cure.

F. Apply sealant compound in a continuous operation, horizontally in one direction and vertically from the bottom to the top. Around framed openings apply continuously around turns and corners to completely fill corners.

G. At completion, all sealed or caulked surfaces shall present a neat appearance and all surrounding surfaces shall be left in a clean condition.

H. All control joints shall be sealed. Seal control joints with traffic bearing sealant with a shore hardness of d40 and a minimum movement capacity of 20%. Sealant must be compatible with floor finishes. Where self-leveling sealant compound is used, the edges of the joint shall be protected by a non-staining, easily removed tape. After joint is filled with sealant compound, the tape shall be removed.

3.8 CLEAN-UP:

A. Upon completion of work, remove all boxes, cartridges and other debris. Clean sealant spillage from all adjacent surfaces.

END OF SECTION 07 90 00

SECTION 08 11 00
HOLLOW METAL DOORS AND FRAMES

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Finish carpentry (Section 06 20 00).
2. Sealants (Section 07 90 00)
3. Door and frame schedule (See Drawings).
4. Wood doors (Section 08 14 00).
5. Aluminum storefront (Section 08 41 00).
6. Door hardware (Section 08 71 00).
7. Glass and Glazing (Section 08 80 00)
8. Field painting of doors and frames (Section 09 91 00).

B. Work Included This Section:

1. Hollow metal doors and frames as shown on Drawings and as specified. See Drawings and schedules for types, sizes, design and location of hollow metal doors, frames and accessories.

2. Fire rated doors and frames with smoke seals.

3. Include all supplementary materials and installation accessories required for a complete and proper installation.

1.3 INDUSTRY STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

American National Standards Institute (ANSI)
American Society for Testing and Materials (ASTM)
Underwriter's Laboratories Inc. (UL)
Steel Door Institute (SDI)
National Fire Protection Association (NFPA)

1.4 QUALITY ASSURANCE:

A. Steel Door & Frame Standard: Provide doors and frames complying with American National Standard Institute “Recommended Specifications Standard Steel Doors and Frames" (ANSI 250.8), (formerly SDI 100) except where requirements specified are more stringent.

B. Fire Rated Door Assemblies: Assemblies complying with NFPA 80 and (UL) UL 10C-98 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.

C. It shall be the responsibility of the door supplier to make necessary field visits to audit existing frame conditions to determine and verify sizes, hands & swing, hardware locations (to be matched accordingly at new doors) prior to submittals. Supplier shall furnish a list of openings where existing frame conditions exhibit damage, alignment problems or excessive wear, with detailed information regarding questionable conditions, to be included as an appendix to the submittals.

1.5 QUALIFICATIONS:

A. Source: Products for use on this Project shall be of one manufacturer for each function unless noted specifically otherwise.

1.6 SUBMITTALS:

A. Shop Drawings: Show typical construction and arrangement of all items. Show conditions at doors and frames in various wall thicknesses and materials. Show hardware reinforcement, anchors and sill clips. Show thicknesses of all metal. Include a schedule listing the location in the building of each item.

B. Product Data: For each type of door and frame indicated.

1.7 PRODUCT HANDLING:

A. Storage:

1. Stack and store frames properly to prevent warpage and other damage. Store doors in vertical position, spaced by blocking to permit circulation of air.

2. Upon delivery, touch up damaged areas of finish with rust inhibitive metal primer specified in Section 09 91 00 for specific exposure of door in final location.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS: Subject to compliance with the Drawings and Specifications, provide product by one of the following, or equal approved in writing by the Architect:

Amweld Building Products Inc.
Ceco Door Products
Curries Co.
D&D Specialties
Fleming
Metal Products Inc.
Republic Builders Products
Steelcraft/Div. American Standard Co.

2.2 MATERIALS:

A. Steel:

1. Cold-Rolled Steel Sheets: ASTM A 366, Commercial Steel (CS), or ASTM A 620, Drawing Steel (DS), Type B.

2. Metallic Coated Steel Sheets: ASTM A 653, Commercial Steel (CS), Type B, with A60 zinc-iron-alloy coating.

3. Steel for face sheets of hollow metal doors and for frame faces shall be stretcher leveled.

B. Shop Coating:

1. After fabrication, apply rust-inhibiting enamel or paint, either air-drying or baked, suitable for the substrate and as a base for the specified field applied finish paint, complying with ANSI A250.10, “Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.”

2.3 DOORS:

A. General: Provide door sizes, thicknesses, and designs indicated.

B. Interior Doors: Provide doors complying with requirements indicated below by referencing ANSI 250.8 for level and model and ANSI A 250.4 for physical endurance level:

1. Level 2 and Physical Performance Level B, (Heavy Duty), Model 2.

C. Exterior Doors: Provide doors complying with requirements indicated below by referencing ANSI 250.8 for level and model and ANSI A 250.4 for physical endurance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2.

2.4 FRAMES:

A. General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A 250.8 and with details indicated for type and profile Conceal fastenings, unless otherwise indicated.

B. Frames of 16-gauge steel sheet for:

1. Level 2 steel doors.
2. Wood doors.

C. Frames of 14-gauge steel sheet for:

1. Level 3 steel doors.

D. Door Silencers: Except on weather stripped frames, drill stops to receive 3 rubber silencers on strike jambs of single door frames and 2 silencers on heads of double swing frames.

E. Plaster Guard: Provide minimum 26-gauge galvanized plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operations.

F. Supports and Anchors: Fabricated from not less than 18-gauge electrolytic zinc-coated or metallic coated steel sheet.

G. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc coated items are to be built into exterior walls, comply with ASTM A 153, Class C or D as applicable.

2.5 FABRICATION:

A. General: Fabricate steel door and frame units to comply with ANSI 250.8 and to be rigid and free from defects including warp and buckle.

B. Hollow Metal Frames:

1. Fabricate frames generally to dimensions and profiles shown on the Drawings except that it shall be the Contractor's responsibility to verify all hollow metal frame throat sizes based upon the partition or wall types and thicknesses shown on the Drawings. Frames for sidelights, transoms and fixed glass windows shall conform to the requirements for door frames specified.

2. Frames shall be manufactured from cold rolled steel. Fabricate frames from 16-gauge steel for interior locations and from 14-gauge steel for exterior locations.

3. Corner joints shall have contact edges closed tight. Miter face. Cope backbend, rabbet and stops. **Continuously weld backbend, face, stop and rabbets.** Exterior and interior frames shall be fully welded. Knock down type frames will not be acceptable. Grind exposed welds smooth and with no depressions.

4. At hardware locations, install reinforcing plates of the following minimum gauges:

a. Hinge and pivot reinforcements: 10 gauges (1 1/4" x 10" minimum size).

b. All other mortised and surface mounted hardware: 14 gauges.

5. Weld reinforcement plates to inner surface of frame with a minimum of 6 welds per plate.

6. At fully templated hardware, mortise, reinforce, drill and tap frames to receive hardware in accordance with hardware manufacturer's templates. Install reinforcements furnished by hardware supplier in accordance with hardware manufacturer's templates furnished with reinforcement, except as modified.

7. Reinforce head of frames (for openings more than 3' 6" wide) where installed in partitions with masonry continuing over frame. Reinforce with angle or channel stiffener fabricated from not less than 12-gauge steel. Weld reinforcing into head in shop. Such reinforcing shall not replace required lintels or load carrying members specified in other Sections of the Specifications or shown on the Drawings.

8. Provide a minimum of 3 anchors in each jamb. For frames over 7'-2" in height, provide an additional anchor for each 2' of height. Fabricate anchors from minimum 14-gauge steel. Anchors shall be appropriate type for wall material.

9. Provide floor clips of not less than minimum 16-gauge steel for frames. Fasten to bottom of frame for anchoring frame to floor construction.

10. Before shipment, install a temporary spreader at bottom of frames. Do not remove until frames are secured in place.

11. After fabrication, apply shop coats as follows:

    a. Exterior frames shall be fabricated from galvanized or galvannealed and phosphatized sheet. Touch up weld areas and areas where zinc coating has been damaged with zinc rich primer. Apply shop primer finish equal to type specified.

    b. Interior frames shall be fabricated from non-galvanized sheet. Apply shop primer finish equal to type specified.

    c. Finished surfaces shall be smooth and free of irregularities.

12. Door Numbers on Frames: Frames shall have the door number (shown on the Architectural Floor Plans of the Drawings) permanently marked on a center hinge reinforcement.

13. **All frames scheduled to receive heavy weight hinges shall have high frequency hinge straps welded at top and bottom of each hinge reinforcement.**

14. **Where smoke seals, sound seals, or weather-stripping are called for, furnish kerfed type frame profile with gasketing suited to the required condition.**

C. Hollow Metal Doors:

1. Doors shall be flush type, 1 3/4" thick, formed of stretcher leveled, cold rolled steel sheets with core as specified, 16 gauges for exterior doors and 18 gauges for interior doors.

    a. Furnish 14 gage “z” astragal at pairs of doors unless hardware set includes split type astragal. Prepare and reinforce accordingly.

2. All exterior doors shall be fabricated from galvanized or galvannealed and phosphatized steel sheet specified in Paragraph 2.1. Interior doors shall be fabricated from non-galvanized sheet.

3. Finished work shall be free from warpage, bulge or buckle. Corner bends shall be true, straight and sharp. Doors shall have no visible

seams or joints on faces or stile edges.

4. Core: Use one of the following core materials that produces a door complying with SDI standards.

   a. Honeycomb Core: A honeycomb core consisting of a resin impregnated kraft paper cellular structure shall be laminated to the inside of both face sheets with an adhesive. The honeycomb material shall have a crushing strength of not less than 4000 lbs. per sq. ft. (psf) and the lamination shall withstand not less than 1100 psf in shear.

      (1) All hollow metal doors are to have this honeycomb core except where the polystyrene core is specified below and where fire rated doors are required.

   b. Polystyrene Core: A rigid core of polystyrene foam board shall be bonded to face sheets with an adhesive. Compressive strength of core shall not be less than 1500 psf and a shear strength of not less than 18 psi. The strength of the bond between the polystyrene and the steel face sheets shall exceed the strength of the polystyrene, so that delamination does not occur under any operating conditions.

      (1) All exterior hollow metal doors (see Door Schedule on Drawings and Section 08 71 00 - Finish Hardware) are to have this polystyrene core.

   c. Core for Fire Rated Doors: See Paragraph "Fire Rated Doors and Frames."

5. Join faces at stile edges by a continuous weld extending full height of door. Welds shall be ground, filled and dressed smooth to make them invisible and to provide a smooth, flush surface.

6. Close top and bottom edges of interior doors with a continuous, recessed steel channel of not less than 16-gauge sheet steel. Close top and bottom edges of exterior doors flush (not recessed) as integral part of door construction or by addition of minimum 16-gauge inverted steel channels. Extend channels full width of door and spot weld to both faces. Space holes in bottom closure of exterior doors to permit escape of entrapped moisture.

7. Provide profiles on both stiles of door as follows:

   a. Single Acting Swing Doors: Beveled 1/8" in 2".

8. Mortise, reinforce, drill and tap doors at factory for fully templated hardware in accordance with approved hardware schedule and with templates supplied by the hardware supplier. Reinforcements shall be welded within door. Where surface mounted hardware is to be applied, provide only reinforcing plates in door. Drilling and tapping for hardware will be done during installation of such hardware in the field, unless noted specifically otherwise in the Contract Documents.

9. Provide reinforcing plates for hardware of the following minimum gauges:

   a. Hinges and pivot reinforcement: 10 gauges

   b. Reinforcement for lock face, flush bolts, concealed holders concealed and surface mounted closers and other hardware: 14 gauges

   c. Reinforcement for push, pull and kick plates: 16 gauges

10. **Hinge and lock stiles shall be a continuous 14 gauge (minimum) integral channel used to form reinforcements.**

11. Factory Finish: Treat all surfaces chemically to insure cleaning and maximum adhesion of finish. Install shop coat of primer complying with ANSI 250.10 for acceptable criteria and equal to types specified for galvanized, galvannealed or non-galvanized surfaces

D. Door Louvers:

1. Louvers built into doors shall be thickness of door, with inverted "V" blades fabricated from minimum 16 gauge cold rolled steel sheet. Door faces shall frame louver blades. Seal at edges to prevent penetration of water.

2. Where required, provide insect screen installed over inside face of louvers and in a removable channel frame. Screen shall be 16 x 18 mesh aluminum screen with black paint finish.

E. Fire Rated Doors and Frames: Where fire rated doors and frames are indicated or required, provide fire rated door and frame assemblies that comply with NFPA 80 "Standard for Fire Doors and Windows", and have been tested, listed, and labeled in accordance with ASTM E 2074, by Underwriter's Laboratories or other nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction. Doors and frames shall bear the required label permanently attached on the hinge side. Door core shall be type standard with the door manufacturer and as tested and certified to bear the required UL label. Fire rated frames shall have factory applied smoke seals.

PART 3: EXECUTION

3.1 COORDINATION:

A. Coordinate the installation of metal doors and frames with the work of other trades. Coordinate operating hardware templates to ensure that doors and frames are properly reinforced in the factory to receive the specified hardware. Verify specific location and type of hardware as required in Section 08 71 00 and Door Schedule on Drawings.

3.2 INSTALLATION:

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer’s data, and as specified.

B. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Install frames plumb, rigid and in true alignment and in accordance with the manufacturer's written instructions and shop drawings approved by the Architect. Brace properly until built into wall.

1. Inspect frames for plumbness and correct positioning before being anchored into wall. Frames installed out of plumb or square shall be corrected or replaced.

2. Secure door frames to floor with a countersunk expansion device at each jamb. Build anchors into walls as the work progresses.

3. Frames installed in masonry or concrete walls shall be filled tight with masonry mortar. Install silencers prior to filling frame.

4. Install exterior frames with 1/4" to 3/8" joint between frame and wall to receive backer rod and sealant in accordance with Section 07 90 00 - Sealants. Interior frames shall be installed tight against adjacent construction and shall be caulked around the entire perimeter to fill minor spaces between the frame and wall.

5. Install fire-rated frames according to NFPA 80.

C. Door Installation: Comply with ANSI 250.8. Hang metal doors plumb and true, with doors making uniform contact with metal frame stops on all sides. Metal doors that cannot be hung to fit evenly on all sides shall be removed and replaced.

1. Install fire-rated doors within clearances as specified in NFPA 80.

2. Doors designated on door shop drawings to be undercut are specified to be factory undercut. Only the minimum amount of job fitting and machining shall be allowed on doors. All doors shall be accurately fitted to their opening and accurately machined for their hardware. In addition, pairs of doors shall have a gap at meeting stiles not exceeding 1/8" at closest point of bevel. Slope of bevel shall not exceed 1/8" in 2".

3. All hardware is furnished under Section 08 71 00. Application of hardware to doors and frames is specified under this Section. The requirements of Section 08 71 00 shall apply to the installation of the door hardware.

4. Receive, store, and be responsible for the door hardware to be installed under this Section. Properly tag, index, and file all keys until turned over to the Owner.

5. Apply hardware in accordance with templates and manufacturer's instructions; mortise and fit accurately, apply securely, and adjust carefully. Exercise care not to injure work when applying hardware. Where butt hinges are applied to wood doors, the door shall be predrilled for a full threaded No. 12 wood screw. Coordinate with shop drawings and Contract Drawings for proper location.

6. Doors shall be finished under Section 09 91 00. Colors to be selected by the Architect, it is the intention for the frames and doors to match adjacent surface colors. Remove doors so they may have their bottoms and tops sealed and finished and then rehang. Cover door hardware until painting is completed. Prior to completion of building, examine doors and hardware, adjust as required, and leave hardware in proper working order, free from defect.

7. ADA Adjustments: The maximum force for pushing or pulling open a door shall be as follows:

   a. Fire doors shall have the minimum opening force allowable by the appropriate administrative authority.

   b. Other doors.

      exterior hinged doors: (Reserved).
      interior hinged doors: 5 lbf (22.2N)
      sliding or folding doors: 5 lbf (22.2N)

3.3 ADJUSTING AND CLEANING:

A. Prime Coat Touch-up: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.

B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08 11 00

SECTION 08 14 00
WOOD DOORS

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Finish carpentry (Section 06 20 00).
2. Hollow metal doors and frames (Section 08 11 00).
3. Door hardware (Section 08 71 00).
4. Glass and glazing (Section 08 80 00).
5. Painting and finishing (Section 09 91 00).
6. Door and frame schedule (Section 08 00 00).

B. Work Included This Section:

1. Flush wood veneered doors as shown on Drawings and as specified herein.

2. Include all supplementary materials and installing accessories required for a complete and proper installation.

1.3 INDUSTRY STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

American National Standards Institute (ANSI)
Architectural Woodwork Institute (AWI)
Underwriter's Laboratory

1.4 QUALITY ASSURANCE:

A. It shall be the responsibility of the door supplier to make necessary field visits to audit existing frame conditions to determine and verify sizes, hands & swing, hardware locations (to be matched accordingly at new doors) prior to submittals. Supplier shall furnish a list of openings where existing frame conditions exhibit damage, alignment problems or excessive wear, with detailed information regarding questionable conditions, to be included as an appendix to the submittals.

1.5 SUBMITTALS:

A. Shop Drawings: Show construction, materials, arrangement and finish of all items. Show dimensions, elevations and details of all doors. Include a schedule listing the location in the building of each door.

B. Samples: Submit (in duplicate) 6" x 12" sample flitches of face veneers specified for Architect's approval.

C. Warranty: Submit warranty in writing, in duplicate, stating doors have been manufactured in complete accordance with Contract Documents. Warranty shall be signed by an officer of the company.

D. Guarantee:

1. Interior doors shall be guaranteed for the life of the installation against any defects which shall make them unsuitable for use for which intended. Any warp in excess of 1/4" in 8' shall be considered a defect under terms of this guarantee. Guarantee shall provide for replacement as originally furnished. Guarantee shall be "full warranty" for the life of the installation.

2. Manufacturer shall inspect installation of doors prior to issuance of guarantee and shall note on guarantee form that no provisions of the guarantee have been voided or nullified in installation or manufacture of doors. Guarantee shall be furnished promptly upon substantial completion of the Project.

3. Guarantee shall state name of Owner, name and location of Project and date of final acceptance.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Shipping: Doors shall be individually carton packed and marked for shipment from the factory and remain packaged until installation.

B. Comply with requirements of referenced standard and manufacturer's written instructions.

C. Delivery, Storage and Protection: Protect doors against dampness and physical damage during and after delivery. Store under cover in a well-ventilated building and where not exposed to extreme changes of temperature or humidity. Do not store or install doors in any part of the building until concrete, masonry and drywall work is dry. Store as required by written instructions of door manufacturer.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Subject to compliance with the Drawings and Specifications, provide doors by one of the following, or equal approved in writing by the Architect:

Algoma Hardwoods Inc.
Buell Door Company
Eggers Hardwood Products Corp.
Graham
Marshfield
Mohawk
Osh Kosh
VT Industries

2.2 MATERIALS:

A. Wood Doors:

1. Doors shall be manufactured to conform to the requirements of Architectural Woodwork Standards (AWS) Custom Standards for Premium Grade doors, (except where specified otherwise) Section 9 and other related sections.

2. See Drawings and schedules for types and sizes.

3. Provide five-ply doors. Seven-ply doors will not be accepted.

4. Doors shall be flush, 1 3/4" thick, with face veneers as specified.

5. Core: Particleboard weighing not less than 30 lbs. per cu. ft. and meeting the requirements of Grade 1-LD-2 of ANSI A 208.1 "Mat Formed Wood Particleboard", except fire rated doors shall have the required core to bear the indicated label.

6. Edge Bands: Provide the door manufacturer's standard hardwood stiles and rails the full height and width of the door. For doors to receive transparent finish, the exposed edge of the hinge and strike stiles shall be same species of wood as the face veneer.

7. Crossbands: Thoroughly kiln-dried hardwood (or engineered composite) minimum of 1/16" thick extending full width of door and laid with grain perpendicular to grain of face veneers, tapeless spliced, employing Type I adhesive. If engineered composite crossband is used provide edge veneer to match the face veneer at both the hinge and strike edges.

8. Face Veneers:

   a. Doors will receive factory applied transparent finish shall be AWS Grade "Premium" Rotary Cut Select White Birch veneers slip matched and installed with vertical grain figure using Type II adhesive.

   b. Face veneers of double doors to receive factory applied transparent finish shall be pair matched color and grain pattern.

   c. Face veneers shall have a minimum thickness of .020".

9. All doors shall be factory finished. All edges of doors, including tops and bottoms, shall be sealed and finished with same finish as the face veneers. This is necessary to prevent moisture from entering the door core through these areas and causing warpage and other defects.
   .

10. Factory Fitting and Machining:

    a. All doors shall be accurately, factory pre-fitted to the opening and pre-machined for the scheduled hardware using door frame and finish hardware shop drawings. All required transoms with those doors listed shall also be factory pre-fitted. In addition, pairs of doors shall have a gap at meeting stiles not exceeding 1/8". Slope of bevel at meeting stiles shall not exceed 1/8" in 2". Where butt hinges are applied to wood doors, the doors shall be predrilled with 5/32" pilot holes for a full threaded No. 12 Type A wood screw 1 1/4" long.

11. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted by labeling agency with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.

    a. Clearances: Provide 1/8-inch clearance at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold.

    b. Comply with NFPA 80 for fire-rated doors.

c. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.

d. Bevel fire-rated doors 1/8 inch in 2 inches on lock edge; trim stiles and rails only to extent permitted by labeling agency.

12. Metal Louvers:

a. Where required by Drawings, shall be sizes indicated of the inverted "V" blade type, 1 3/4" thick, 20-gauge steel, bonderized and prime coated ready for field painting. Louvers shall be the door manufacturer's standard and shall be factory installed.

13. Vision Panels:

a. Openings shall be factory cut. All moldings, stops and trim required to install glazing shall be metal lite kit furnished by the door manufacturer painted to match door. Sizes as shown on Drawings.

14. Fire-Rated Doors:

a. Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies per ASTM E 2074 and which are labeled and listed for ratings indicated by UL, Warnock Hersey or other testing and inspection agency acceptable to authorities having jurisdiction. Units shall bear the label permanently attached on the hinge side or top of each unit. Face veneers shall be same grade and species as specified for non-fire-rated doors. Fire rated doors shall be category A with factory applied concealed intumescent seals.

b. All fire-rated doors shall include hardwood multi-ply stiles and rails approximately 5/8" deep except where surface mounted closers or fire exit devices are to be attached to the door the door shall include 5" deep core reinforcement material at these locations. Core reinforcement for closers or fire exit devices shall be the door manufacturer's standard blocking for fire rated doors and shall be located and sized as required to receive the specified hardware.

c. Vision Panels: Openings shall be factory cut. All frames, moldings, trim exposed to view, shall be a UL or WHI approved metal lite kit painted to match door. Fire-rated doors will receive identical finish as non-fire-rated doors. Sizes as shown on Drawings.

d. Fire-rated doors shall include a mineral core of composition and density required by Underwriters Laboratories or Warnock Hersey for the indicated fire-rating.

e. Requirements specified for non-fire-rated doors shall be applicable to fire-rated doors specified in this Paragraph except as modified in this Paragraph.

f. Comply with UL10-C for Positive Pressure Fire Testing.

PART 3: EXECUTION

3.1 INSTALLATION:

A. Follow written recommendations of door manufacturer for work on doors to maintain the specified guarantee by door manufacturer.

B. Prior to the installation of any doors or application of any finish hardware, examine all door frames for their proper installation. Door frames found to be out of plumb and square alignment, not securely fabricated or installed, shall be reinstalled by the frame installer prior to beginning work performed under this Section.

C. Doors designated on door shop drawings to be undercut are specified to be factory undercut. Only the minimum amount of job fitting and machining shall be allowed on doors. All doors shall be accurately fitted to their opening and accurately machined for their hardware. In addition, pairs of doors shall have a gap at meeting stiles not exceeding 1/8" at closest point of bevel. Slope of bevel shall not exceed 1/8" in 2".

D. All hardware is furnished under Section 08 71 00. Application of hardware to doors and frames is specified under this Section. The requirements of Section 08 71 00 shall apply to the installation of the door hardware.

E. Receive, store, and be responsible for the door hardware to be installed under this Section. Properly tag, index, and file all keys until turned over to the Owner.

F. Apply hardware in accordance with templates and manufacturer's instructions; mortise and fit accurately, apply securely, and adjust carefully. Exercise care not to injure work when applying hardware. Where butt hinges are applied to wood doors, the door shall be predrilled for a full threaded No. 12 wood screw. Coordinate with shop drawings and Contract Drawings for proper location.

END OF SECTION 08 14 00

SECTION 08 17 00
INTEGRATED DOOR OPENING ASSEMBLIES

PART 1: GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Integrated door opening assemblies including metal frame, integrated door system with operating hardware, and associated door hardware as specified in this section.
2. Factory finishing of wood doors.
3. Factory fitting and hardware preparation for doors and frames.

B. Related Sections:

1. Division 08 Section "Hollow Metal Doors and Frames" for integrated assembly doors installed in standard hollow metal frames.
2. Division 08 Section "Glazing" for glass view panels in integrated assemblies.
3. Division 09 Section "Interior Painting" for field painting integrated assembly doors and frames.
4. Division 26 "Electrical" Sections for electrical connections including conduit and wiring for door controls and operators installed on integrated assembly doors and frames with factory installed electrical knock out boxes.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ANSI A156.32 - Integrated Door Opening Assemblies.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. Intertek Testing Service (ITS Warnock Hersey) - Certification Listings for Fire Doors.
7. Window and Door Manufacturers Association - WDMA I.S.1-A Architectural Wood Flush Doors.
8. ICC/IBC - International Building Code.
9. NFPA 70 - National Electrical Code.
10. NFPA 80 - Fire Doors and Windows.
11. NFPA 101 - Life Safety Code.
12. NFPA 105 - Installation of Smoke Door Assemblies.
13. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
14. CARB – California Air Resources Board.
15. State Building Codes, Local Amendments.

D. Standards: All hardware specified herein to comply with the current version year of the following industry standards:

1. ANSI/BHMA Certified Product Standards, A156 Series.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including integrated opening assembly construction and installation details, material descriptions, core descriptions, hardware reinforcements, profiles, anchorage, fire resistance rating, operational descriptions and finishes.

B. Door Hardware Schedule: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Include the following information:

1. Type, style, function, size, label, hand, and finish of each door hardware item.
2. Manufacturer of each item.
3. Fastenings and other pertinent information.
4. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
5. Explanation of abbreviations, symbols, and codes contained in schedule.
6. Mounting locations for door hardware.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of door and frames types including dimensioned profiles and metal thicknesses.
3. Locations of reinforcement and preparations for hardware.
4. Details of anchorages, joints, field splices, and connections.
5. Details of accessories.
6. Details of moldings, removable stops, and glazing.
7. Details of conduit and preparations for power, signal, and control systems.
8. Provide all dimensions necessary required to complete recessed pockets.

D. Keying Schedule: Reference Division 08 Section "Door Hardware" for keying requirements.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete integrated assembly installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the installed assemblies and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.4 QUALITY ASSURANCE

A. Quality Standard: In addition to requirements specified, comply with ANSI A156.32, latest edition, "Integrated Door Opening Assemblies".

B. Source Limitations: Obtain complete integrated opening assemblies, including metal frame and integrated door system with operating hardware, through one source and from a single manufacturer wherever possible.

C. Supplier Qualifications: Factory authorized distributor of manufacturer(s) systems and products. Submit written documentation upon request.

D. Installer Qualifications: Installers acceptable by the primary assembly manufacturer, with a minimum [3] years documented experience installing both standard and electrified integrated door opening assemblies similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

E. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:

1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:

   a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
   b. Door Closers: Comply with the following maximum opening-force requirements indicated:

      1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
      2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

2. NFPA 101: Comply with the following for means of egress doors:

   a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.

   b. Thresholds: Not more than 1/2 inch high.

3. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 (neutral pressure at 40" above sill) or UL-10C.

   a. Test Pressure: Positive pressure labeling.

F. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing integrated door opening assemblies.

1. Prior to installation, arrange for manufacturers' representatives to hold a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.

3. Review sequence of operation narratives for each unique access-controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project site under provisions Division 01 Section "Product Storage and Handling Requirements". Inspect doors, frames, and hardware with representatives of the supplier to verify shipment is complete and to rectify discrepancies promptly.

1. Integrated door assembly systems to be delivered to the job site complete with necessary screws, miscellaneous parts, instructions, and installation templates. Each package legibly and properly labeled to correspond to the approved Door Schedule.

B. Furnish integrated door opening assemblies with operating hardware flush to door skin, using protective wrappings and spacers between projecting hardware. Maintain and protect door assemblies using cardboard spacers and protective edge guards along the door edges, to reduce exposure to marring or damage during storage.

C. Store integrated door opening assemblies in dry and secure area. Do not store electronic access control software, credentials, or accessories at Project site without prior authorization.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Electrical Connections: Coordinate the layout and installation of scheduled electrified hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

1.8 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article will not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and are in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty Periods: Manufacturer's standard written form, with the exceptions noted below, warranting integrated door opening assemblies to be free of defect in material or workmanship under normal use for a period of five (5) years.

1. Continuous Hinges: Ten (10) years.
2. Door Closers: Ten (10) years.

C. Warranty includes the manufacturer, at their sole option, agreeing to repair or replace products or parts found to be defective in material or workmanship according to details contained in the warranty certificate.

1.9 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of integrated door opening assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Adams Rite Manufacturing (RD) - The RITE Door.
2. Total Door.
3. Syntegra
4. Substitutions: Requests for substitutions and product approval for inclusive integrated door opening assembly systems in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 WOOD DOOR MATERIAL REQUIREMENTS

A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty; Aesthetic Grade: Custom.

B. Fire Rated Doors: Provide construction and core as needed to provide fire ratings indicated.

1. Category A Edge Construction: Provide fire rated door edge construction with intumescent seals concealed by outer stile (Category A) at 45, 60, and 90-minute rated doors. Comply with specified requirements for exposed edges.

2. Pairs: Provide fire retardant stiles that are listed and labeled for applications indicated without formed steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

C. Environmentally Responsible Doors: Provide doors constructed with the following environmentally responsible characteristics:

1. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain added urea formaldehyde.

D. Core Construction:

1. Engineered Composite Core Wood Doors:

a. Structural Composite Lumber: Engineered hardwood composite wood products tested in accordance with WDMA I.S.1A, Testing Cellulosic Composite Materials for Use in Fenestration Products containing no added Urea Formaldehyde. Comply with minimum performance levels below:

1) Screw Withdrawal, Face: 700 lbf (3100 N).
2) Screw Withdrawal, Edge: 550 lbf (2440 N).

b. LEED: Meet requirements of EQ4.4.

c. Basis of Design: RITE Door EC.

2. Mineral Core Doors:

a. Core: Non-combustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire protection rating indicated.

b. Blocking: Provide composite blocking with improved screw holding capability approved for use in doors of fire protection ratings indicated as needed to eliminate through-bolting hardware.

c. Edge Construction: At hinge stiles, provide laminated edge construction with improved screw holding capability and split resistance. Comply with specified requirements for exposed edges.

d. Basis of Design: RITE Door FD.

E. Veneered Doors for Transparent Finish:

1. Grade: Custom

2. Faces: Veneer grades as noted below; veneer minimum 1/50-inch (0.5mm) thickness at moisture content of 12% or less.

a. Plain Sliced Select White Birch, A grade faces.

3. Match between Veneer Leaves: Book match.

4. Assembly of Veneer Leaves on Door Faces:

a. Balance match.

5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.

6. Transom Match: Continuous match.

7. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.

8. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors

9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit sanded before applying face veneers.

F. Light Frames and Glazing:

1. Wood Beads for Light Openings in Wood Doors up to and including 20-minute rating:

a. Wood Species: Same species as door faces.
b. Profile: Manufacturer’s standard lipped profile. At wood core doors with 20-minute fire protection ratings, provide wood beads and metal glazing clips approved for such use.

2. Metal Frames for Light Openings in Fire Rated Doors Over 20-Minutes: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated.

3. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with the flush wood door manufacturer's written instructions.

2.3 STEEL MATERIAL REQUIREMENTS

A. General:

1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

2. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

B. Steel Frames:

Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M. Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

1. Fabricate frames with mitered or coped corners.

2. Fabricate frames with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.

3. Frames for openings up to 48 inches in width: Minimum 16-gauge thick steel sheet.

4. Frames for openings 48 inches and wider in width: Minimum 14-gauge thick steel sheet.

5. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

6. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

7. Provide suitable adjustable type anchors for wall condition, minimum 4 each per jamb.

2.4 DOOR HARDWARE MATERIAL REQUIREMENTS:

A. Provide a complete integrated door opening assembly, including the installation and adjustment of the latching mechanism within the door construction. Refer to drawings for hardware application requirements.

B. Door hardware to include the following minimum products for each integrated door opening assembly. Item numbers listed as a basis of design:

Set: 63.0
Doors: 202A, 307A, 407A, 507A, 606A, 707A, 807A
Description: Rated Elevator Cab Exit – See Section 081700 Integrated Door Opening Assemblies

1	Continuous Hinge	D300 83-1/8"	630	RI	
1	Recessed Exit	D3676	US32D	RI	
1	Lever Trim (passage)	D3080-01 -9	US32D	RI	
1	Surface Closer	7500ST-180	689	NO	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Electromagnetic Holder	998M	689	RF	⚡
1	Seal Kit	D-SS-STK-DBZ	Dk Brz	RI	

Notes: All listed hardware by Section 081700 integrated door assembly manufacturer.

Set: 64.0
Doors: 202B, 306A, 402A, 502A, 607A, 702A, 802A
Description: Rated Elevator Cab Exit Pair - See Section 081700 Integrated Door Opening Assemblies

2	Continuous Hinge	D300 83-1/8"	630	RI	
2	Recessed Exit	D3677	US32D	RI	
1	Lever Trim (passage)	D3080-01 -9	US32D	RI	
2	Surface Closer	7500ST-180	689	NO	
2	Kick Plate	K1050 12" High	US32D	RO	
2	Electromagnetic Holder	998M	689	RF	⚡
2	Seal Kit	D-SS44-STK-DBZ	Dk Brz	RI	

Notes: Balance of hardware by Section 081700 integrated door assembly manufacturer.

C. Integrated exit device hardware to be clean and unobtrusive in design with a minimal bar height of 2-7/16-inches. Push rails not exceed a projection of 1-1/8-inches when in the latched position and be made of heavy duty aluminum extrusion, available in anodized and architectural finishes using metal cladding. Exit device end caps to be of metal construction and should match the trim cover caps when available.

D. Lever handles to match design of similar lever locking hardware furnished on project.

E. Door hardware may include the following optional products for each integrated door opening assembly as specified in the Door Hardware Sets under Part 3:

1. Accessory Items: Magnetic Holders, Protection Plates, Edge Guards, Astragals, Smoke Seals.

2.5 FINISH REQUIREMENTS

A. Veneered Wood Finishes:

1. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

2. Transparent Finish: Provide a clear protective coating over the wood veneer allowing the natural color and grain of the selected wood species to provide the appearance specified. Stain is applied to the wood surface underneath the transparent finish to add color and design flexibility.

    a. Grade: Premium.
    b. Finish: Meet or exceed WDMA I.S. 1A TR6 Catalyzed Polyurethane finish performance requirements.
    c. Staining: As selected by Architect from manufacturer's full range.
    d. Sheen: Satin.

B. Steel Finishes:

1. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

    a. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

C. Hardware Finishes: As specified in Hardware Sets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify the accuracy of dimensions given to the integrated door opening assembly manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of installation indicates acceptance of the existing conditions.

D. Verify power supplies, as required, are available to power electrically operated devices.

3.2 INSTALLATION

A. General: Install integrated door opening assemblies plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; integrated locking/latching devices; closing devices; and seals.

C. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
3. Provide blocking in drywall partitions where wall stops, or other wall mounted hardware is located.

D. Coordinate installation and interface wiring with fire alarm and smoke detection systems.

E. Remove or protect furnished hardware accessories, prior to painting or finishing completed after the installation of the hardware accessories.

3.3 FIELD QUALITY CONTROL

A. Field Inspection: Perform a final inspection of installed integrated door opening assemblies and state in report whether work complies with or deviates from specification requirements, including whether door hardware is properly installed, operating and adjusted.

3.4 ADJUSTMENT

A. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Remove and replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.5 CLEANING AND PROTECTION

A. Protect all door opening assemblies and hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install hardware at the latest possible time frame.

B. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure integrated door and operating hardware is without damage or deterioration at time of owner occupancy.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer or finish paint.

3.6 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain integrated door opening assemblies and hardware.

3.7 HARDWARE SETS

A. The integrated door opening hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

END OF SECTION 08 17 00

SECTION 08 31 00
ACCESS DOORS

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Provide access doors as shown and specified including all accessory items required for a complete and proper installation.

B. Extent, location, and size of each type of access door required are indicated on the Drawings.

C. GWB installed in recessed panels (Section 09 29 00).

1.3 QUALITY ASSURANCE:

A. Fire-Resistance Ratings: Wherever a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in Underwriter's Laboratories, Inc.; "Classified Building Materials Index" for rating shown.

1. Provide UL label on each fire-rated access door.

B. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units which may vary slightly from sizes indicated.

C. Coordination: Furnish inserts and anchoring devices which must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of access door assembly, including setting drawings, templates, instructions and directions for installation of anchorage devices.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Subject to compliance with the Drawings and Specifications, provide access doors by one of the following, or equal approved in writing by the Architect:

Bilco Company
J. L. Industries
Karp Associates Inc.
Milcor Inc.
Nystrom Inc.

2.2 MATERIALS AND FABRICATION:

A. Fire Rated: Where fire rated access doors are required, provide a Fire-Rated Access Door for walls and for ceilings and sized and located as shown on the Drawings. Furnish each access door assembly manufactured as an integral unit, complete with all parts and ready for installation.

B. Steel Access Doors and Frames: Fabricate units of continuous welded steel construction, unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.

C. Frames: Fabricate from 16-gauge steel.

1. Fabricate frame with exposed flange approximately 1" wide around perimeter of frame.

D. Flush Panel Doors: Fabricate from not less than 14-gauge sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees. Finish with manufacturer's factory-applied prime paint.

1. For fire-rated units, provide manufacturer's standard insulated flush panel/doors, with continuous piano hinge and self-closing mechanism.

E. Recessed Panel Doors: Fabricate from not less than 18-gauge sheet steel with face of panel formed to provide recess below surface of applied finish. Reinforce panel as required to prevent buckling. Finish with manufacturer's factory-applied prime paint.

1. All units located in GWB ceilings are to be recessed.

F. Locking Devices: Furnish flush, screwdriver-operated cam locks of number required to hold door in flush, smooth plane when closed.

1. Provide one-cylinder lock per access door. Furnish 2 keys per lock and key all locks alike, unless otherwise scheduled.

2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

PART 3: EXECUTION

3.1 INSTALLATION:

A. Comply with manufacturer's instructions for installation of access doors.

B. Coordinate installation with work of other trades.

C. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

3.2 ADJUST AND CLEAN:

A. Adjust hardware and panels after installation for proper operation.

B. Remove and replace panels or frames which are warped, bowed or otherwise damaged.

END OF SECTION 08 31 00

SECTION 08 41 10
ALUMINUM STOREFRONT FRAMING AND ENTRY DOORS

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Caulking and sealants (Section 07 90 00).
2. Door hardware for aluminum storefront doors (Section 08 71 00).
3. Glass and glazing (Section 08 80 00).

B. Work Included This Section:

1. Aluminum storefront framing and storefront doors as shown on the Drawings and specified.

2. Supplementary components and installation accessories required for a complete and proper and watertight installation.

3. Glass and glazing for storefront system and doors shall be furnished and installed under this Section and is specified in Section 08 80 00.

4. Sealing of storefront system shall be furnished and installed under this Section and is specified under Section 07 90 00.

1.3 INDUSTRY STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

Architectural Aluminum Manufacturers Association (AAMA)
American National Standard Institute (ANSI)
The American Society for Testing and Materials (ASTM)
The Aluminum Association (AA)

1.4 QUALIFICATIONS:

A. Source: Products for use on this Project shall be of one manufacturer unless noted specifically otherwise herein.

B. Installer: Aluminum framing and doors shall be installed by qualified installer approved in writing by the manufacturer.

1.5 SUBMITTALS:

A. Shop Drawings: Include complete elevations of the storefront system, details and method of anchorage, location and installation of doors, door frame reinforcement, hardware, size, shape and thickness of materials, joints and connections, details of joining with other work and relation to adjacent work. Indicate all glass types to be furnished.

B. Samples: Samples of finish shall be submitted to the Architect for approval. All materials installed shall fall within the range of the approved samples. Submit samples of each type of glass to be furnished. Samples shall be clearly identified as to Project and type of finish.

C. Manufacturer's Data: Submit copies of manufacturer's technical and performance data.

D. Guarantee: The Contractor shall submit duplicate original copies of the written guarantee for the complete system specified herein. This guarantee shall state all work furnished and installed under this Section is in accordance with the Contract Documents and shall guarantee an airtight and watertight installation for a period of two (2) years from the date of final acceptance by the Owner. It shall further state that during the guarantee period any defective workmanship or material shall be repaired or replaced, at the direction of the Architect, at no additional cost to the Owner. In addition to the above guarantee, the storefront contractor shall submit a separate guarantee for the glazing included herein and specified under Section 08 80 00.

1.6 PRODUCT HANDLING:

A. Delivery and Storage: All storefront members shall be handled and stored in such a way as to prevent damage to finishes. All members with scratches or other defects will be rejected. Deliver doors in heavy wrapping. Store in a manner to prevent physical damage to door and finish.

PART 2: PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS: Subject to compliance with the Drawings and Specifications, provide product by one of the following, or equal approved in writing by the Architect:

Efco Corporation
Kawneer Company Inc.
Old Castle
Tubelite Architectural Products Inc.
YKK AP America Inc.

2.2 QUALITY STANDARD:

A. General Requirements: For purposes of describing type and quality of products required, the Drawings and Specifications are based upon the YES 45TU Thermal Framing System and the 50D Wide Stile Entrance Doors by YKK. Other products by above manufacturers will be accepted. It is not required that product by other manufacturers be identical to the specified product, however it shall be both similar and equal in the judgement of the Architect in order to be acceptable.

2.3 FRAMING SYSTEM:

A. Materials:

1. Extrusion shall be 6063-T5 alloy and temper (ASTM B 221 alloy G.S. 10A-T5). The thermal barrier shall consist of a two-part, chemically curing, high density polyurethane, or other equal polymer standard with the storefront manufacturer. Fasteners, where exposed, shall be solid aluminum or stainless steel. Plated or coated fasteners will not be acceptable. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from the aluminum. Glazing gaskets shall be elastomeric extrusions.

B. Fabrication:

1. The framing system shall provide for flush glazing on all sides with no projecting stops. Vertical and horizontal framing members shall have a nominal face dimension of 2". Overall depth shall be 4-1/2". Entrance framing members shall be compatible with glass framing in appearance. All single acting entrance frames shall include positive barrier weathering.

C. Performance:

1. Resistance to Air Infiltration: Air infiltration shall not exceed .06 cfm per sq. ft. of fixed area when tested at a pressure of 1.56 psf in accordance with ASTM E 283.

2. Resistance to Water Infiltration: When tested in accordance with ASTM E 331, the wall shall not leak at a minimum test pressure of 6.0 psf.

3. Performance Under Uniform Load: When tested in accordance with ASTM E 330, the maximum deflection of any member shall not exceed 1/175 of its span and, when the load is removed, there shall be no evidence of permanent deformation or damage when tested under a wind load of 25 psf.

4. Expansion: The system shall provide for expansion and contraction of the component materials as will be required by an ambient temperature range of 120° F. without causing harmful buckling or cracking, opening of joints, undue stress on fasteners or other effects detrimental to weathering performance.

5. Thermal: Framing members shall incorporate a thermal barrier which eliminates all direct contact between interior and exterior aluminum sections.

D. Finish:

1. Bronze Anodized to match existing.

2.4 ALUMINUM ENTRANCE DOORS:

A. Doors shall be **50**D Wide Stile Entrance Doors by YKK, or equal by other manufacturers listed in this Section in Paragraph "Acceptable Manufacturers".

B. Door, door frame and trim moldings shall be extruded of 6063-T5 aluminum alloy and temper (ASTM B221 alloy G.S. 10A-T5).

C. Glazing gaskets for doors and frames shall be EPDM extrusions, or equal.

D. All screws and miscellaneous fasteners shall be aluminum, stainless steel or zinc plated steel in accordance with ASTM A 164.

E. Doors and door frames shall be fabricated complete by the entrance manufacturer including the preparation for and installation of all operating hardware. Hardware shall be furnished under Section 08 71 00 and shipped to this door manufacturer and factory installed by this door manufacturer.

F. Door stiles and rails shall be 1 3/4" thick, and the sections shall have a minimum wall thickness of 1/8".

G. The door stile and rail face dimensions shall be:

Vertical Stile:	5"
Top Rail:	5"
Bottom Rail:	10" (handicap requirement)

H. Weather-stripped aluminum moldings, fitted to each door and frame, shall form continuous interlocks between the hinge and lock jambs and the closed door. Each door opening shall be weather-stripped at jambs, head and threshold. Glazing moldings and trim inserts shall not be less than 1/16" thick.

I. Corner construction shall consist of mechanical clip fastening, SIGMA deep penetration and fillet welds. Glazing stops shall be snap-in type with EPDM glazing gaskets.

J. Transom bar shall be joined to the jambs using a heavy walled jointer, clip and four #12 thread forming screws. Threshold clip to be heavy wall 5/32" thick steel and cover 3/4 of the depth of the jamb for extended stability. It is to be secured with machine screws.

K. Finish shall be same as specified for the aluminum framing.

L. Door Hardware: Specified in Section 08 71 00.

2.5 GLAZING:

A. Furnish and install all glass and glazing specified in Section 08 80 00 or shown on the Drawings for the aluminum framing and doors.

2.6 CAULKING AND SEALING:

A. Furnish and install all caulking and sealing necessary to weatherproof and seal juncture of aluminum framing and other materials. Material and application shall be as specified in Section 07 90 00.

PART 3: EXECUTION

3.1 INSTALLATION:

A. Install work under this Section in accordance with the Contract Drawings, these Specifications, approved shop drawings and manufacturer's printed instructions using mechanics skilled in storefront workmanship.

B. Items of storefront construction shall be set in their correct location as shown by Contract Drawings and shop drawing details; and shall be level, plumb, square and at their proper elevation and in alignment with all adjacent work.

C. Where moldings are jointed at corners, they shall be cut accurately and neatly fitted to result in a tightly closed miter or the joint shall be covered with a molding cap mitered and welded at the factory.

D. Install with concealed fastenings.

E. Gaskets shall be installed under compression according to dimensions recommended by the manufacturer. All joints shall be flush.

F. After erection, protect exposed portions of the work from damage by welding, polishing machines, plaster, lime, acid, cement and other harmful compounds.

G. Material shall be handled carefully and protected before and after erection.

H. Insulate aluminum from dissimilar metals. Use Black Asphaltum where concealed. Use neoprene sheet where visible.

I. Install glass and glazing as specified in Section 08 80 00.

J. Install sealants as specified in Section 07 90 00.

K. All splice covers shall be set in non-drying mastic. Joint sleeves shall be sealed to adjacent members with a skinning type elastic sealant. Aluminum heads, sills and jambs shall be sealed to surround with a skinning type sealant on inside and outside perimeter joints to block through metal conduction.

L. All exposed flashing used in conjunction with the storefront system shall be furnished and installed by the storefront installer and shall be aluminum flashing with same finish as specified for the storefront system.

M. Upon completion of the installation and prior to final acceptance, completely clean all storefront members with manufacturer's recommended cleaner.

3.2 WATER HOSE TEST:

A. Upon completion of installation of the aluminum storefront work, a water test shall be run on an adequate portion of the storefront work, in the judgement of the Architect, to ensure that the work is watertight.

B. All glass, gaskets and sealants shall be in place prior to tests.

C. Water Spray Test: Before installation of interior finishes has begun, an adequate portion (in the judgement of the Architect) shall be tested in accordance with AAMA 501.2 and shall show no evidence of water penetration.

D. All tests shall be made by the General Contractor in the presence of the storefront subcontractor and the Architect and Owner.

E. If any leaks occur during or after the test, corrective measures shall be taken, and the test shall be rerun until the system successfully passes the water test. Cost of retesting is the Contractor’s expense.

F. All test results shall be submitted by the Contractor in writing to the Architect for review.

END OF SECTION 08 41 10

SECTION 08 58 31
EXCHANGE WINDOWS

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Gypsum drywall opening to receive window (Section 09 29 00).
2. Sealant work (Section 07 90 00).

B. Work Included This Section:

1. Exchange windows as shown on Drawings and specified herein, including all supplementary components and installation accessories required for a complete and proper installation.

1.3 SUBMITTALS:

A. Manufacturer's Data: Submit manufacturer's literature completely describing the window and including detailed installation instructions.

PART 2: PRODUCTS

2.1 MATERIALS:

A. Provide Model XW3636 Exchange Window by Creative Industries Inc., Indianapolis, IN, or equal approved in writing by the Architect.

B. Extruded aluminum frame fastened together with screws. Window is to clamp in place with bolts positioned through back frame into threaded section of front frame.

C. Bullet resistant glazing of 1-1/4" Lexgard Class III is to be factory sealed into the frame.

D. Stainless steel shelf shall have of built-in deal tray below window lite.

E. Talk Thru in the window shall be Creative Industries No. 6-FR, or equal approved in writing by the Architect, for interior application and shall be 6” Stainless Steel.

PART 3: EXECUTION

3.1 COORDINATION:

A. Coordinate the installation of pass thru windows with the work of other related trades.

B. Frame shall be sealed around entire perimeter both outside and inside, using materials and workmanship specified in Section 07 90 00.

3.2 INSTALLATION:

A. Install in accordance with the Drawings and Specifications, approved submittals and the manufacturer's printed instructions.

B. Windows shall be plumb, level, rigid and permanently secured in place, complete and properly installed and ready for use

C. All moving parts shall operate freely without sticking or binding or otherwise operating improperly.

END OF SECTION 08 58 30

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Sliding doors.
3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

C. Related Sections:

1. Hollow Metal Doors and Frames (Section 08 11 00).
2. Flush Wood Doors (Section 08 14 00).
3. Integrated Door Opening Assemblies (Section 08 17 00).
4. Aluminum-Framed Entrances and Storefronts (Section 08 41 10).
5. Automatic Door Operators (Section 08 72 10).
6. Access Control (See Electrical Drawings).

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.
h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and

special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

1. It shall be the responsibility of the door supplier to make necessary field visits to audit existing frame conditions to determine and verify sizes, hands & swing, hardware locations (to be matched accordingly at new doors) prior to submittals. Supplier shall furnish a list of openings where existing frame conditions exhibit damage, alignment problems or excessive wear, with detailed information regarding questionable conditions, to be included as an appendix to the submittals.

D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to

source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Ten years for mortise locks and latches.
2. Seven years for heavy duty cylindrical (bored) locks and latches.
3. Five years for exit hardware.
4. Twenty five years for manual surface door closer bodies.
5. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

    a. Two Hinges: For doors with heights up to 60 inches.
    b. Three Hinges: For doors with heights 61 to 90 inches.
    c. Four Hinges: For doors with heights 91 to 120 inches.
    d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

    a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
    b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

    a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

    a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

    a. Bommer Industries (BO).
    b. Hager Companies (HA).
    c. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).

B. Pivots: ANSI/BHMA A156.4, Grade 1, certified. Space intermediate pivots equally not less than 25 inches on center apart or not more than 35 inches on center for doors over 121 inches high. Pivot hinges to have oil impregnated bronze bearing in the top pivot and a radial roller and thrust bearing in the bottom pivot with the bottom pivot designed to carry the full weight of the door. Pivots to be UL listed for windstorm where applicable.

1. Manufacturers:

    a. Architectural Builders Hardware (AH).
    b. Ives (IV).
    c. Rixson Door Controls (RF).

C. Sliding and Folding Door Hardware: Hardware is to be of type and design as specified and should comply with ANSI/BHMA A156.14.

1. Bi-folding Door Hardware: Rated for door panels weighing up to 125 lb.

2. Manufacturers:

    a. Hager Companies (HA).
    b. Johnson Hardware (JO).
    c. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

2.3 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

    a. Hager Companies (HA) - ETW-QC (# wires) Option.
    b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC (# wires) Option.
    c. Stanley Hardware (ST) – C Option.

B. Electrified Quick Connect Intermediate Transfer Pivots: Provide electrified offset intermediate transfer pivot hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

    a. Architectural Builders Hardware (AH) – EL019-EZ (# wires).
    b. Rixson Door Controls (RF) - E-M19-QC (# wires).

C. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:
    a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.
    b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

    a. Hager Companies (HA) - Quick Connect.
    b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) – QC-C Series.
    c. Stanley Hardware (ST) – WH Series.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Manufacturers:

    a. Door Controls International (DC).
    b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    c. Trimco (TC).

B. Coordinators: ANSI/BHMA A156.3 certified door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Door Controls International (DC).
    c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
1. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

2. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Hiawatha, Inc. (HI).
    c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years' experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

C. Cylinders: Original manufacturer cylinders complying with the following:

1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
5. Keyway: Match Facility Restricted Keyway.

D. Patented Cylinders: ANSI/BHMA A156.5, Grade 1, certified patented cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.

1. Manufacturers:

a. Medeco (MC) - X4 Series.
b. Sargent Manufacturing (SA) - XC Series.
c. Yale Locks and Hardware (YA) - LFIC KeyMark

E. Keying System: Each type of lock and cylinders to be factory keyed.

1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Key locks to Owner's existing system.

F. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).
4. Construction Control Keys (where required): Two (2).
5. Permanent Control Keys (where required): Two (2).

G. Construction Keying: Provide temporary keyed construction cores.

H. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

I. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Mortise locks to be certified Security Grade 1.

2. Manufacturers:

a. Corbin Russwin Hardware (RU) – ML2000 Series.
b. Stanley Best (BE) – 40H-UN Series.
c. Yale Locks and Hardware (YA) – 8800FL Series.

B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.

1. Furnish with solid cast levers, standard 2 3/4” backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.

2. Locks are to be non-handed and fully field reversible.

3. Manufacturers:

a. Corbin Russwin Hardware (RU) – CL3300 Series.
b. Stanley Best (BE) – 9K Series.
c. Yale Locks and Hardware (YA) 5400LN Series.

C. Knurling: Where required by local code provide knurling or abrasive coating to all levers on doors leading to hazardous areas such as mechanical rooms, boiler and furnace rooms, janitor closets, and as otherwise required or specified.

2.7 ELECTROMECHANICAL LOCKING DEVICES

A. Electromechanical Mortise Locksets, Grade 1 (Heavy Duty): Subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below.

1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, deadbolt monitoring, and request-to-exit signaling. Support end-of-line

resistors contained within the lock case. Unless otherwise indicated, provide electrified locksets standard as fail secure.

2. Manufacturers:

    a. Corbin Russwin Hardware (RU) - ML20900 Series.
    b. Sargent Manufacturing (SA) - 8200 Series.
    c. Yale Locks and Hardware (YA) – 8800FL Series.

B. Electromechanical Cylindrical Locksets, Grade 1 (Heavy Duty): Subject to same compliance standards and requirements as mechanical cylindrical locksets, electrified locksets to be of type and design as specified below.

1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, and request-to-exit signaling. Unless otherwise indicated, provide electrified locksets standard as fail secure.

2. Manufacturers:

    a. Corbin Russwin Hardware (RU) - CL33900 Series.
    b. Stanley Best (BE) - 93K EL/EU Series.
    c. Yale Locks and Hardware (YA) - 5480/5490LN Series.

2.8 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.9 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

5. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.

6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.

9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

10. Extended cycle test: Devices to have been cycle tested in ordinance with ANSI/BHMA 156.3 requirements to 9 million cycles.

11. Rail Sizing: Provide exit device rails factory sized for proper door width application.

12. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Manufacturers:

    a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
    b. Sargent Manufacturing (SA) - 80 Series.

2.10 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.

4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Manufacturers:

a. Sargent Manufacturing (SA) - 351 Series.
b. Norton Door Controls (NO) - 7500 Series.
c. Yale Locks and Hardware (YA) - 4400 Series.

C. Door Closers, Surface Mounted (Unitrol): Unitrol arms to have door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - Unitrol Series.
b. Norton Door Controls (NO) - Unitrol Series.
c. Yale Locks and Hardware (YA) - Unitrol Series.

2.11 SURFACE MOUNTED CLOSER HOLDERS

A. Electromagnetic Door Holders: Certified ANSI A156.15 electromagnetic door holder/releases with a minimum 20 to 40 pounds holding power and single coil construction able to

accommodate.12VDC, 24VAC, 24VDC and 120VAC. Coils to be independently wound, employing an integral fuse and armatures to include a positive release button.

1. Manufacturers:

    a. LCN Door Closers (LC) - SEM7800 Series.
    b. Rixson (RF) - 980/990 Series.
    c. Sargent Manufacturing (SA) - 1560 Series.

2.12 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:

    a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    c. Trimco (TC).

2.13 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

    a. Hager Companies (HA).
    b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

    a. Glynn Johnson (GJ).
    b. Rixson Door Controls (RF).
    c. Sargent Manufacturing (SA).

2.14 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. National Guard Products (NG).
2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
3. Reese Enterprises, Inc. (RE).

2.15 ELECTRONIC ACCESSORIES

A. Networked Contactless Smart Card Readers: Contactless smart cards reader to securely read access control data from 13.56 MHz contactless smart cards. The contactless smart card reader is designed for use in access control applications by providing:

1. Secure access control data exchange between the smart card and the reader utilizing key diversification and mutual authentication routines.
2. Contactless smart card reader to be designed for low current operation to enable migration from most legacy proximity applications without the need to replace existing access control panels and/or power supplies. Operating voltage: 5-16 VDC. Current requirements: 55 mA Avg, 116 mA Peak at 12 VDC.
3. Universal compatibility with most access control systems and backwards compatibility with legacy 125 KHz proximity access control formats.
4. Product construction suitable for both indoor and outdoor applications.
5. Customizable behavior for indicator lights and audible tones.

6. Acceptable Manufacturers (13.56 MHz iClass):

    a. Corbin Russwin Hardware (RU) - 744F709/744F719 Series.
    b. HID Global (HD) - R10/R40 Series.
    c. Sargent Manufacturing (SA) - 6100/6120 Series.

B. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

    a. Security Door Controls (SD) - DPS Series.
    b. Securitron (SU) - DPS Series.

C. Power Supplies: Provide Nationally Recognized Testing Laboratory Listed 12VDC or 24VDC (field selectable) filtered and regulated power supplies. Include battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Manufacturers:

    a. Corbin Russwin Hardware (RU) - BPS Series.
    b. Security Door Controls (SD) - 630 Series.
    c. Securitron (SU) - BPS Series.
    d. Yale Locks and Hardware (YA) 782.

2.16 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.17 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a

hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. Manufacturer's Abbreviations:

1. MK - McKinney
2. RI - RITE Door
3. PE - Pemko
4. RF - Rixson
5. RO - Rockwood
6. YA - Yale
7. HO - Horton Automatics
8. NO - Norton
9. HG - HID Global
10. SU - Securitron
11. OT - OTHER
12. LU - Lund Equipment Co., Inc.

Hardware Sets

Set: 1.0
Doors: 100-2
Description: Exterior Aluminum Entry / Exit with Timer Controlled Latch

1	Pivot Set	147	626	RF	
1	Electrified Inter Pivot	EM19 QC-12	626	RF	⚡
1	Exit Device (rim, nightlatch)	7100 B P 632F K845xCT7LL	630	YA	⚡
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surface Closer	UNIJ4400 SNB134-47	689	YA	
1	Threshold	171AK WS10SS		PE	
1	Sweep	315CN TKSP8		PE	
1	ElectroLynx Harness	QC-C012		MK	⚡
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	Position Switch	DPS-M-GY		SU	⚡
1	Controller	782		YA	⚡
1	Knox Box	3262		OT	

Notes: Perimeter gasket by frame manufacturer.
Access control panel and security software by security contractor.
Prep door and hinge jamb for electromechanical device.
OPERATION: Door control panel timer retracts and holds latchbolt back during open hours and releases latchbolt during closed hours. Device is fail-secure with inside RX switch and outside key override. Inside pushbar always allows egress.
Door position is monitored by magnetic switch for authorized egress.

Set: 2.0
Doors: 100-3
Description: Exterior Aluminum Entry / Exit with Timer Controlled Latch + ADA Operator

1	Pivot Set	147	626	RF	
1	Electrified Inter Pivot	EM19 QC-12	626	RF	⚡
1	Exit Device (rim, nightlatch)	7100 B P 632F K845xCT7LL	630	YA	⚡

1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Automatic Operator	7000 Series by Section 087113 Sub	AL	HO	
1	Threshold	171AK WS10SS		PE	
1	Sweep	315CN TKSP8		PE	
1	ElectroLynx Harness	QC-C012		MK	⚡
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	
1	Position Switch	DPS-M-GY		SU	⚡
1	Controller	782		YA	⚡

Notes: Perimeter gasket by frame manufacturer.
Operator push pads and outside pedestal by Section 087113 subcontractor.
Access control panel and security management software by security integrator.
Prep door and hinge jamb for electromechanical device.
OPERATION: Open Hours: Door control panel timer retracts and holds back latchbolt and activates outside pushpad.
Closed Hours: Device is normally locked. Card reader outside or inside pushpad retract latchbolt and cycle operator. Automatic relock.
Electronic device function is fail-secure with inside RX switch in rail. Device has outside key override. Inside rail always allows egress.
Operator cycles in sequence with vestibule door operator.
Door position is monitored by magnetic switch for authorized egress.

Set: 3.0
Doors: 100-1
Description: Exterior Entry / Exit Function Pair

2	Pivot Set	147	626	RF	
2	Intermediate Pivot	M19	626	RF	
1	Exit Device (SVR,TT Control)	7210 513F K825xCT7LL	630	YA	
1	Exit Device (SVR, dummy trim)	7210 514F	630	YA	
1	LFIC Keymark Core	K800 CGMK	626	YA	
2	Surface Closer	UNIJ4400 SNB134-47	689	YA	
1	Threshold	171AK WS10SS		PE	
2	Sweep	315CN TKSP8		PE	
2	Position Switch	DPS-M-GY		SU	⚡

Notes: Perimeter gasket by frame manufacturer
Door contact switch indicates propped door condition.
Devices are dogged down for push pull operation during open hours.

Set: 4.0
Doors: 017, 018-1, 019-1
Description: Exterior Fob Access / Exit

2	Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK	
1	Hinge (heavy weight)	T4A3386 QC12 4-1/2" x 4-1/2"	US32D	MK	⚡
1	Exit Device (rim, nightlatch)	7100 B P 632F K845xCT7LL	630	YA	⚡
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surface Closer	UNI4400	689	YA	
1	Threshold	171AK WS10SS		PE	
1	Gasketing	S88BL Head & Jambs		PE	
1	Sweep	315CN TKSP8		PE	
1	ElectroLynx Harness	QC-C012		MK	⚡

1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	
1	Position Switch	DPS-M-GY		SU	⚡
1	Controller	782		YA	⚡
1	Knox Box	3262		OT	

Notes: Locate Knox Box as directed by architect.
Access control panel and security software by security contractor.
Prep door and hinge jamb for electromechanical device. Provide Wire Harness in door.
OPERATION: Card reader outside temporarily retracts latchbolt - auto relock. Device is fail-secure with inside RX switch and outside key override. Inside pushbar always allows egress.
Door position is monitored by magnetic switch for authorized egress.

Set: 5.0
Doors: 013
Description: Rated Exit-Only - Monitored & Gasketed

2	Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK	
1	Hinge (heavy weight)	T4A3386 QC12 4-1/2" x 4-1/2"	US32D	MK	⚡
1	Exit Device (rim, RX, EO)	7100F B EO	630	YA	⚡
1	Surface Closer	UNI4400	689	YA	
1	Threshold	171AK WS10SS		PE	
1	Gasketing	S88BL Head & Jambs		PE	
1	Sweep	315CN TKSP8		PE	
1	ElectroLynx Harness	QC-C012		MK	⚡
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	Position Switch	DPS-M-GY		SU	⚡

Notes: Exit-only device - no outside trim.
Door position is monitored by magnetic switch for authorized egress.

Set: 6.0
Doors: 011
Description: Rated Fob Access Pair - Monitored

5	Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK	
1	Hinge (heavy weight)	T4A3386 QC12 4-1/2" x 4-1/2"	US32D	MK	⚡
1	Flush Bolt (auto,set)	2842	US26D	RO	
1	Fail Secure Lock	MOR 8891FL K825xCT7LL REX	626	YA	⚡
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Coordinator	576	US26D	RO	
2	Surface Closer (reg/pa)	4400	689	YA	
1	Threshold	171AK WS10SS		PE	
1	Gasketing	S88BL Head & Jambs		PE	
2	Sweep	308AV TKSP8		PE	
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	ElectroLynx Harness	QC-C300		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	
2	Position Switch	DPS-M-GY		SU	⚡
1	Power Supply	BPS-24 x Amperage as Required		SU	⚡

Notes: Overlapping astragal by door manufacturer.
Door position is monitored by magnetic switch for authorized egress.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Provide wiring harness in door.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 7.0
Doors: 004
Description: Rated Fob Access - Monitored

2	Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK	
1	Hinge	TA2314 QC12 4-1/2" x 4-1/2"	US32D	MK	⚡
1	Fail Secure Lock	MOR 8891FL K825xCT7LL REX	626	YA	⚡
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surface Closer	UNI4400	689	YA	
1	Threshold	171AK WS10SS		PE	
1	Gasketing	S88BL Head & Jambs		PE	
1	Sweep	315CN TKSP8		PE	
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	ElectroLynx Harness	QC-C300		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	
1	Position Switch	DPS-M-GY		SU	⚡
1	Power Supply	BPS-24 x Amperage as Required		SU	⚡

Notes: Door position is monitored by magnetic switch for authorized egress.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Provide wiring harness in door.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 8.0
Doors: 014
Description: Rated Fob Access Pair - Armory

5	Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK	
1	Hinge	TA2314 QC12 4-1/2" x 4-1/2"	US32D	MK	⚡
2	Flush Bolt	555	US26D	RO	
1	Fail Secure Lock	MOR 8897FL K825xCT7LL REX	626	YA	⚡
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surf Overhead Hold Open	9-X26	630	RF	
1	Surface Closer	4420T	689	YA	
1	Threshold	1715AK WS10SS		PE	
1	Gasketing	S88BL Head & Jambs		PE	
1	ElectroLynx Harness	QC-C012		MK	⚡
1	ElectroLynx Harness	QC-C300		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	
1	Position Switch	DPS-M-GY		SU	⚡
1	Power Supply	BPS-24 x Amperage as Required		SU	⚡

Notes: Overlapping astragal by door manufacturer.
Door position is monitored by magnetic switch for authorized egress.
Security management software and access control panel by others.

Prep door and hinge jamb for electronic lock. Provide wiring harness in door.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 9.0
Doors: 203-2
Description: Mechanical Room Pair - Roof Access

6	Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK	
2	Flush Bolt	555	US26D	RO	
1	Bored Lock (storeroom)	MO 5405LN K800 Knurling	626	YA	
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surf Overhead Hold Open	9-X26	630	RF	
1	Surface Closer	4420T	689	YA	
1	Threshold	1715AK WS10SS		PE	
1	Gasketing	S88BL Head & Jambs		PE	
2	Sweep	308AV TKSP8		PE	
2	Position Switch	DPS-M-GY		SU	⚡

Notes: Door contact switch indicates propped door condition - by security subcontractor.
Overlapping astragal by door manufacturer.

Set: 10.0
Doors: 016
Description: Storeroom Function - Pump Room

3	Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK
1	Bored Lock (storeroom)	MO 5405LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Surface Closer	UNI4400	689	YA
1	Threshold	171AK WS10SS		PE
3	Silencer	608-RKW		RO

Notes: Door position is monitored by magnetic switch for authorized egress.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Provide wiring harness in door.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 11.0
Doors: 101-1
Description: Aluminum Push-Pull Pair

2	Pivot Set	147	626	RF
2	Intermediate Pivot	M19	626	RF
2	Push Bar & Pull	BF15747	US32D	RO
2	Surface Closer	UNIJ4400 SNB134-47	689	YA

Notes: Perimeter gasket by frame manufacturer.

Set: 12.0
Doors: 101-2
Description: Aluminum Push-Pull

1	Pivot Set	147	626	RF	
1	Intermediate Pivot	M19	626	RF	
1	Push Bar & Pull	BF15747	US32D	RO	
1	Surface Closer	UNIJ4400 SNB134-47	689	YA	

Set: 13.0
Doors: 101-3
Description: Aluminum Push-Pull + ADA Operator

1	Pivot Set	147	626	RF	
1	Intermediate Pivot	M19	626	RF	
1	Push Bar & Pull	BF15747	US32D	RO	
1	Automatic Operator	7000 Series by Section 087113 Sub	AL	HO	

Notes: Operator push pads and outside pedestal by Section 087113 subcontractor.
OPERATION: Handicap actuator either side cycles operator. Operator cycles in sequence with outside operator.

Set: 14.0
Doors: 163
Description: Rated Fob Access / Exit

2	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK	⚡
1	Exit Device (rim, nightlatch)	7100F B P 632F K845xCT7LL	630	YA	⚡
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surface Closer	PR4400 SNB134-47	689	YA	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Wall Stop	409	US32D	RO	
1	Gasketing	S88BL Head & Jambs		PE	
1	ElectroLynx Harness	QC-C012		MK	⚡
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	
1	Position Switch	DPS-M-GY		SU	⚡
1	Controller	782		YA	⚡

Notes: Access control panel and security software by security contractor.
Prep door and hinge jamb for electromechanical device. Provide Wire Harness in door.
OPERATION: Card reader outside temporarily retracts latchbolt - auto relock. Device is fail-secure with inside RX switch and outside key override. Inside pushbar always allows egress.

Set: 15.0
Doors: 018-2, 019-2
Description: Rated Fob Access / Exit

2	Hinge (heavy weight)	T4A3386 NRP 4-1/2" x 4-1/2"	US32D	MK	
1	Hinge (heavy weight)	T4A3386 QC12 4-1/2" x 4-1/2"	US32D	MK	⚡
1	Exit Device (rim, nightlatch)	7100F B P 632F K845xCT7LL	630	YA	⚡
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA	
1	Wall Stop	400 EXP	US26D	RO	
1	Gasketing	S88BL Head & Jambs		PE	

1	ElectroLynx Harness	QC-C012		MK	⚡
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	
1	Position Switch	DPS-M-GY		SU	⚡
1	Controller	782		YA	⚡

Notes: Access control panel and security software by security contractor.
Prep door and hinge jamb for electromechanical device. Provide Wire Harness in door.
OPERATION: Card reader outside temporarily retracts latchbolt - auto relock. Device is fail-secure with inside RX switch and outside key override. Inside pushbar always allows egress.
Door position is monitored by magnetic switch for authorized egress.

Set: 16.0
Doors: 143, 158-2, 171, 187, 200-2, 300-2, 301, 400-2, 401, 500-2, 501, 600-2, 601, 700-2, 701, 800-2, 801
Description: Rated Fob Access / Exit - Fail Safe

2	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK	⚡
1	Electric Exit Device (rim, fail safe)	7100F B MO690F K845xCT7LL	630	YA	⚡
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Wall Stop	409	US32D	RO	
1	Gasketing	S88BL Head & Jambs		PE	
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	ElectroLynx Harness	QC-C300		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	
1	Position Switch	DPS-M-GY		SU	⚡
1	Power Supply	BPS-24 x Amperage as Required		SU	⚡

Notes: Door position is monitored by magnetic switch for authorized egress.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Provide wiring harness in door.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-safe with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 16.1
Doors: 109-2
Description: Rated Fob Access / Exit - Fail Safe

2	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK	⚡
1	Electric Exit Device (rim, fail secure)	7100F B MO691F K845xCT7LL	630	YA	⚡
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Wall Stop	409	US32D	RO	
1	Gasketing	S88BL Head & Jambs		PE	
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	ElectroLynx Harness	QC-C300		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	

1	Position Switch	DPS-M-GY		SU	⚡
1	Power Supply	BPS-24 x Amperage as Required		SU	⚡

Notes: Door position is monitored by magnetic switch for authorized egress.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Provide wiring harness in door.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 17.0
Doors: 201
Description: Rated Fob Access / Exit - Fail Safe

2	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK	⚡
1	Electric Exit Device (rim, fail safe)	7100F B MO690F K845xCT7LL	630	YA	⚡
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surf Overhead Stop	9-X36	652	RF	
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Gasketing	S88BL Head & Jambs		PE	
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	ElectroLynx Harness	QC-C300		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	
1	Position Switch	DPS-M-GY		SU	⚡
1	Power Supply	BPS-24 x Amperage as Required		SU	⚡

Notes: Door position is monitored by magnetic switch for authorized egress.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Provide wiring harness in door.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-safe with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 18.0
Doors: 186-1
Description: Rated Classroom Function / Exit Pair

6	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Removable Mullion (keyed)	KRM200F 7'	600	YA
1	Exit Device (rim, classroom)	7100F MO626F K845xCT7LL	630	YA
1	Exit Device (rim, exit only)	7100F EO	630	YA
1	Cylinder	K820 CT7LL	626	YA
2	LFIC Keymark Core	K800 CGMK	626	YA
2	Surface Closer	UNI4400 SNB134-47	689	YA
2	Kick Plate	K1050 12" High	US32D	RO
1	Gasketing	S88BL Head & Jambs		PE
1	Mullion Gasketing	5110BL		PE

Set: 19.0
Doors: 147-1, 147-2
Description: Classroom Function / Exit

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK

1	Exit Device (rim, classroom)	7100 MO626F K845xCT7LL	630	YA	
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surface Closer	PR4400 SNB134-47	689	YA	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Wall Stop	409	US32D	RO	
1	Gasketing	S88BL Head & Jambs		PE	

Set: 20.0
Doors: 158-1, 600-1, 800-1
Description: Rated Passage Function / Exit

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Exit Device (rim, passage)	7100F MO628F	630	YA	
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Wall Stop	409	US32D	RO	
1	Gasketing	S88BL Head & Jambs		PE	

Set: 21.0
Doors: 159, 200-1, 300-1, 400-1, 500-1, 700-1
Description: Rated Passage Function / Exit

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Exit Device (rim, passage)	7100F MO628F	630	YA	
1	Surface Closer	UNI4400 SNB134-47	689	YA	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Gasketing	S88BL Head & Jambs		PE	

Set: 22.0
Doors: 009-2
Description: Rated Fob Access Pair - Storeroom

5	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Hinge	TA2714 QC12 4-1/2" x 4-1/2"	US26D	MK	⚡
2	Flush Bolt	555	US26D	RO	
1	Dust Proof Strike	570	US26D	RO	
1	Electrified Bored Lock	MO 5491LN K800 REX	626	YA	⚡
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA	
2	Kick Plate	K1050 12" High	US32D	RO	
2	Wall Stop	409	US32D	RO	
1	Gasketing	S88BL Head & Jambs		PE	
2	Silencer	608-RKW		RO	
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	ElectroLynx Harness	QC-C300		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	
2	Position Switch	DPS-M-GY		SU	⚡
1	Power Supply	BPS-24 x Amperage as Required		SU	⚡

Notes: Mount closer on active leaf - room side.
Overlapping astragal by door manufacturer.
Door position is monitored by magnetic switch for authorized egress.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Provide wiring harness in door.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function

is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 23.0
Doors: R01A, R01B-2
Description: Rated Fob Access - Roof Access

2	Hinge	TA2314 NRP 4-1/2" x 4-1/2"	US32D	MK	
1	Hinge	TA2314 QC12 4-1/2" x 4-1/2"	US32D	MK	⚡
1	Electrified Bored Lock	MO 5491LN K800 REX	626	YA	⚡
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surface Closer (reg/pa)	4400	689	YA	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Wall Stop	400 EXP	US26D	RO	
1	Threshold	171AK WS10SS		PE	
1	Gasketing	S88BL Head & Jambs		PE	
1	Sweep	308AV TKSP8		PE	
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	ElectroLynx Harness	QC-C300		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	
1	Position Switch	DPS-M-GY		SU	⚡
1	Power Supply	BPS-24 x Amperage as Required		SU	⚡

Notes: Door position is monitored by magnetic switch for authorized egress.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Provide wiring harness in door.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 24.0
Doors: 402, 502
Description: Fob Access - Fail Safe

2	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK	⚡
1	Fail Safe Lock	MOR 8890FL K825xCT7LL REX	626	YA	⚡
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Wall Stop	409	US32D	RO	
3	Silencer	608-RKW		RO	
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	ElectroLynx Harness	QC-C300		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	
1	Position Switch	DPS-M-GY		SU	⚡
1	Power Supply	BPS-24 x Amperage as Required		SU	⚡

Notes: Door position is monitored by magnetic switch for authorized egress.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Provide wiring harness in door.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-safe with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 25.0

Doors: 407, 507
Description: Fob Access - Fail Safe

2	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK	⚡
1	Fail Safe Lock	MOR 8890FL K825xCT7LL REX	626	YA	⚡
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surface Closer	PR4400 SNB134-47	689	YA	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Wall Stop	409	US32D	RO	
3	Silencer	608-RKW		RO	
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	ElectroLynx Harness	QC-C300		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	
1	Position Switch	DPS-M-GY		SU	⚡
1	Power Supply	BPS-24 x Amperage as Required		SU	⚡

Notes: Door position is monitored by magnetic switch for authorized egress.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Provide wiring harness in door.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-safe with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 26.0
Doors: 116, 307-1, 454, 503
Description: Fob Access

2	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK	⚡
1	Fail Secure Lock	MOR 8891FL K825xCT7LL REX	626	YA	⚡
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surface Closer	PR4400 SNB134-47	689	YA	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Wall Stop	409	US32D	RO	
1	Silencer	608-RKW		RO	
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	ElectroLynx Harness	QC-C300		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	
1	Position Switch	DPS-M-GY		SU	⚡
1	Power Supply	BPS-24 x Amperage as Required		SU	⚡

Notes: Door position is monitored by magnetic switch for authorized egress.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Provide wiring harness in door.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 27.0
Doors: 186-2
Description: Rated Fob Access

2	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK	⚡
1	Fail Secure Lock	MOR 8891FL K825xCT7LL REX	626	YA	⚡

1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surface Closer	PR4400 SNB134-47	689	YA	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Wall Stop	409	US32D	RO	
1	Gasketing	S88BL Head & Jambs		PE	
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	ElectroLynx Harness	QC-C300		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	
1	Position Switch	DPS-M-GY		SU	⚡
1	Power Supply	BPS-24 x Amperage as Required		SU	⚡

Notes: Door position is monitored by magnetic switch for authorized egress.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Provide wiring harness in door.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 28.0
Doors: 105-2, 307-2
Description: Rated Fob Access

2	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Hinge (heavy weight)	T4A3786 QC12 4-1/2" x 4-1/2"	US26D	MK	⚡
1	Fail Secure Lock	MOR 8891FL K825xCT7LL REX	626	YA	⚡
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surface Closer	UNI4400 SNB134-47	689	YA	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Gasketing	S88BL Head & Jambs		PE	
1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	ElectroLynx Harness	QC-C300		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	
1	Position Switch	DPS-M-GY		SU	⚡
1	Power Supply	BPS-24 x Amperage as Required		SU	⚡

Notes: Door position is monitored by magnetic switch for authorized egress.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Provide wiring harness in door.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 29.0
Doors: PH02
Description: Fob Access pair - Machine Room

5	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Hinge	TA2714 QC12 4-1/2" x 4-1/2"	US26D	MK	⚡
2	Flush Bolt	555	US26D	RO	
1	Dust Proof Strike	570	US26D	RO	
1	Electrified Cylindrical Lock	MO 5491LN K800 Knurling REX	626	YA	⚡
1	LFIC Keymark Core	K800 CGMK	626	YA	
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA	
2	Kick Plate	K1050 12" High	US32D	RO	
2	Wall Stop	409	US32D	RO	
1	Gasketing	S88BL Head & Jambs		PE	
1	Astragal	357SS 84" TKSP8		PE	

1	ElectroLynx Harness	QC-C1500P		MK	⚡
1	ElectroLynx Harness	QC-C300		MK	⚡
1	Wall Card/fob reader	SE-RP40	BLK	HG	
2	Position Switch	DPS-M-GY		SU	⚡
1	Power Supply	BPS-24 x Amperage as Required		SU	⚡

Notes: Mount closer on active leaf - room side.
Door position is monitored by magnetic switch for authorized egress.
Security management software and access control panel by others.
Prep door and hinge jamb for electronic lock. Provide wiring harness in door.
OPERATION: Card Reader outside temporarily unlocks outside lever: auto-relock. Electronic lock function is fail-secure with inside RX switch. Outside trim has key override. Inside trim always allows egress.

Set: 30.0
Doors: 010-1, 145, 146
Description: Storeroom Function Pair + O H Holders

6	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
2	Flush Bolt	555	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Bored Lock (storeroom)	MO 5405LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
2	Surf Overhead Hold Open	9-X26	630	RF
1	Astragal	357SS 84" TKSP8		PE
2	Silencer	608-RKW		RO

Set: 31.0
Doors: 203-1, 203-3
Description: Rated Mechanical Room / Exit Pair

6	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Removable Mullion (keyed)	KRM200F 7'	600	YA	
1	Exit Device (rim, nightlatch)	7100F B P 632F K845xCT7LL	630	YA	⚡
1	Exit Device (rim, exit only)	7100F EO	630	YA	
1	LFIC Keymark Core	K800 CGMK	626	YA	
2	Surface Closer	4420 SNB134-47	689	YA	
1	Gasketing	S88BL Head & Jambs		PE	
1	Mullion Gasketing	5110BL		PE	

Notes: Mount closer on active leaf - room side.

Set: 32.0
Doors: 010-2, 116A, 127, 135, 149A, 150, 151, 161, 165, 167, 173, 302A, 324, 427A, 527A, 602A, 714A, 815A
Description: Storeroom Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (storeroom)	MO 5405LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 33.0
Doors: 509A, 728, 729, 730, 731, 817
Description: Mechanical Closet

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (storeroom)	MO 5405LN K800 Knurling	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Wall Stop	409	US32D	RO
1	Gasketing	S88BL Head & Jambs		PE

Set: 34.0
Doors: 006, 206, 718, 723
Description: Storeroom Function + O H Holder

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (storeroom)	MO 5405LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Surf Overhead Hold Open	9-X26	630	RF
3	Silencer	608-RKW		RO

Set: 35.0
Doors: 409A, 414A, 419A, 432A, 437A, 442A, 447A, 454A, 503A, 514A, 519A, 532A, 537A, 542A, 547A, 726, 727
Description: Mechanical Closet + O H Holder

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (storeroom)	MO 5405LN K800 Knurling	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Surf Overhead Hold Open	9-X26	630	RF
1	Gasketing	S88BL Head & Jambs		PE

Set: 36.0
Doors: 105-1, 117, 167A, 205, 303, 426, 526, 603, 713, 717, 816
Description: Storeroom Function + Closer

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (storeroom)	MO 5405LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA
1	Kick Plate	K1050 12" High	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Notes: Mount closer on room side.

Set: 36.1
Doors: 304, 305, 404, 405, 504, 505
Description: Storeroom Function + Closer

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (storeroom)	MO 5405LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA
1	Kick Plate	K1050 12" High	US32D	RO
1	Mop Plate	K1050 6" High	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Notes: Mount closer on room side.

Set: 37.0

Doors: 302, 427, 527, 602, 714, 815
Description: Electrical Closet + Closer

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (storeroom)	MO 5405LN K800 Knurling	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Surface Closer	PR4400 SNB134-47	689	YA
1	Kick Plate	K1050 12" High	US32D	RO
1	Wall Stop	409	US32D	RO
1	Gasketing	S88BL Head & Jambs		PE

Set: 38.0
Doors: 009-1, 160-2
Description: Rated Storeroom

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (storeroom)	MO 5405LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Surface Closer (reg/pa)	4400	689	YA
1	Wall Stop	400 EXP	US26D	RO
1	Gasketing	S88BL Head & Jambs		PE

Set: 39.0
Doors: 318-1, 318-2
Description: Mechanical Room + Closer

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (storeroom)	MO 5405LN K800 Knurling	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA
1	Kick Plate	K1050 12" High	US32D	RO
1	Wall Stop	409	US32D	RO
1	Gasketing	S88BL Head & Jambs		PE

Set: 40.0
Doors: 007, 109-1
Description: Rated Storeroom Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (storeroom)	MO 5405LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Surface Closer	PR4400 SNB134-47	689	YA
1	Kick Plate	K1050 12" High	US32D	RO
1	Wall Stop	409	US32D	RO
1	Gasketing	S88BL Head & Jambs		PE

Set: 41.0
Doors: 157
Description: Electrical Room + Closer

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (storeroom)	MO 5405LN K800 Knurling	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Surface Closer	4420 SNB134-47	689	YA
1	Wall Stop	409	US32D	RO
1	Gasketing	S88BL Head & Jambs		PE

Set: 42.0
Doors: 104, 108, 111, 112, 113, 114, 115, 120, 123A, 124, 125, 126, 128, 129, 132, 133, 134, 138, 139, 140, 153, 154, 154A, 155, 155A, 164, 166, 176, 180-2, 181, 182, 309, 310, 311, 313, 314, 315, 316, 317, 319, 320, 408, 410, 411, 412, 413, 415, 416, 417, 418, 420, 421, 422, 425, 428, 429, 430, 431, 433, 434, 435, 436, 438, 439, 440, 441, 443, 444, 445, 446, 448, 449, 450, 451, 452, 453, 456, 510, 511, 512, 513, 515, 516, 517, 518, 520, 521, 522, 525, 528, 529, 530, 531, 533, 534, 535, 536, 538, 539, 540, 541, 543, 544, 545, 546, 548, 549, 550, 551, 552, 553, 554, 715, 716, 721, 722, 724, 725, 809, 810, 811, 812, 813
Description: Office

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (entry)	MO 5404LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO
1	Coat Hook	796	US26D	RO

Set: 43.0
Doors: 174-1, 174-2, 180-1
Description: Office

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (entry)	MO 5404LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Surf Overhead Stop	9-X36	652	RF
3	Silencer	608-RKW		RO
1	Coat Hook	796	US26D	RO

Set: 44.0
Doors: 002, 004A
Description: Rated Office - Entry Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (entry)	MO 5404LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA
1	Kick Plate	K1050 12" High	US32D	RO
1	Wall Stop	409	US32D	RO
1	Gasketing	S88BL Head & Jambs		PE

Set: 45.0
Doors: 003
Description: Rated Office - Entry Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (entry)	MO 5404LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Surf Overhead Stop	9-X36	652	RF
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA
1	Kick Plate	K1050 12" High	US32D	RO
1	Gasketing	S88BL Head & Jambs		PE
1	Wall Mount Key Cabinet	150% Capacity with Tags & Index		LU

Set: 46.0
Doors: 710
Description: Classroom Function Pair

6	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK

1	Flush Bolt (auto set)	2962	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Bored Lock (classroom)	MO 5408LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Coordinator	576	US26D	RO
2	Surf Overhead Stop	9-X36	652	RF
2	Surface Closer (reg/pa)	4400	689	YA
2	Kick Plate	K1050 12" High	US32D	RO
1	Astragal	357SS 84" TKSP8		PE
2	Silencer	608-RKW		RO

Set: 46.1
Doors: 814-1
Description: Classroom Function Pair

6	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Flush Bolt (auto set)	2962	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Bored Lock (classroom)	MO 5408LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Coordinator	576	US26D	RO
2	Surface Closer (reg/pa)	4400	689	YA
2	Kick Plate	K1050 12" High	US32D	RO
2	Wall Stop	409	US32D	RO
1	Astragal	357SS 84" TKSP8		PE
2	Silencer	608-RKW		RO

Set: 47.0
Doors: 102
Description: Rated Clasroom Function Pair

6	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Flush Bolt (auto set)	2962	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Classroom Lock	MOR 8808FL K820	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Coordinator	576	US26D	RO
2	Surface Closer	UNI4400 SNB134-47	689	YA
2	Kick Plate	K1050 12" High	US32D	RO
1	Astragal	357SS 84" TKSP8		PE
2	Silencer	608-RKW		RO

Set: 48.0
Doors: 137, 141, 149, 185, 711, 719-1, 719-2, 814-2
Description: Classroom Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (classroom)	MO 5408LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 49.0
Doors: 123, 160-1
Description: Classroom Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK

1	Bored Lock (classroom)	MO 5408LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Surf Overhead Stop	9-X36	652	RF
3	Silencer	608-RKW		RO

Set: 50.0
Doors: 130, 136, 152, 177, 326, 703, 720, 803-1
Description: Classroom Function + Closer

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (classroom)	MO 5408LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA
1	Kick Plate	K1050 12" High	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 51.0
Doors: 121, 162, 803-2
Description: Classroom Function + Closer + O H Stop

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (classroom)	MO 5408LN K800	626	YA
1	LFIC Keymark Core	K800 CGMK	626	YA
1	Surf Overhead Stop	9-X36	652	RF
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA
1	Kick Plate	K1050 12" High	US32D	RO
3	Silencer	608-RKW		RO

Set: 52.0
Doors: 179-2
Description: Privacy Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (privacy)	MO 5402LN	626	YA
1	Mop Plate	K1050 6" High	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO
1	Coat Hook	796	US26D	RO

Set: 53.0
Doors: 179-1
Description: Privacy Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (privacy)	MO 5402LN	626	YA
1	Surf Overhead Stop	9-X36	652	RF
1	Mop Plate	K1050 6" High	US32D	RO
3	Silencer	608-RKW		RO
1	Coat Hook	796	US26D	RO

Set: 54.0
Doors: 455, 555, 708, 709
Description: Privacy Function + Closer

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (privacy)	MO 5402LN	626	YA

1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA
1	Kick Plate	K1050 12" High	US32D	RO
1	Mop Plate	K1050 6" High	US32D	RO
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO
1	Coat Hook	796	US26D	RO

Set: 55.0
Doors: 106, 107
Description: Rated Privacy Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (privacy)	MO 5402LN	626	YA
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA
1	Kick Plate	K1050 12" High	US32D	RO
1	Mop Plate	K1050 6" High	US32D	RO
1	Wall Stop	409	US32D	RO
1	Gasketing	S88BL Head & Jambs		PE
1	Coat Hook	796	US26D	RO

Set: 56.0
Doors: 005
Description: Rated Privacy Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Lock (privacy)	MO 5402LN	626	YA
1	Surface Closer	UNI4400 SNB134-47	689	YA
1	Kick Plate	K1050 12" High	US32D	RO
1	Gasketing	S88BL Head & Jambs		PE
1	Coat Hook	796	US26D	RO

Set: 57.0
Doors: 322, 508
Description: Passage Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Latchset (passage)	MO 5401LN	626	YA
1	Wall Stop	409	US32D	RO
3	Silencer	608-RKW		RO

Set: 58.0
Doors: 105A
Description: Passage Function + O H Holder

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Latchset (passage)	MO 5401LN	626	YA
1	Surf Overhead Stop	10-X36	652	RF
3	Silencer	608-RKW		RO

Set: 59.0
Doors: 184
Description: Passage Function + Closer + O H Stop

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Bored Latchset (passage)	MO 5401LN	626	YA
1	Surf Overhead Stop	9-X36	652	RF
1	Surface Closer (reg/pa)	4400	689	YA

1	Kick Plate	K1050 12" High	US32D	RO	
3	Silencer	608-RKW		RO	

Set: 60.0
Doors: 001
Description: Rated Passage Function

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Passage Latch	MOR 8801FL	626	YA	
1	Surface Closer	PR4400 SNB134-47	689	YA	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Wall Stop	409	US32D	RO	
1	Gasketing	S88BL Head & Jambs		PE	

Set: 61.0
Doors: R01B-1
Description: Rated Passage Function

3	Hinge	TA2714 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Bored Latchset (passage)	MO 5401LN	626	YA	
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Wall Stop	409	US32D	RO	
1	Gasketing	S88BL Head & Jambs		PE	

Set: 62.0
Doors: 118, 119, 168, 169, 172, 312, 604, 605, 704, 705, 804, 805
Description: Push-Pull

3	Hinge (heavy weight)	T4A3786 NRP 4-1/2" x 4-1/2"	US26D	MK	
1	Pull Plate	BF 111x70C	US32D	RO	
1	Surface Closer (reg/pa)	4400 SNB134-47	689	YA	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Mop Plate	K1050 6" High	US32D	RO	
1	Wall Stop	409	US32D	RO	
3	Silencer	608-RKW		RO	

Set: 63.0
Doors: 202A, 307A, 407A, 507A, 606A, 707A, 807A
Description: Rated Elevator Cab Exit - Integrated Door

1	Continuous Hinge	D300 83-1/8"	630	RI	
1	Recessed Exit	D3676	US32D	RI	
1	Lever Trim (passage)	D3080-01 -9	US32D	RI	
1	Surface Closer	7500ST-180	689	NO	
1	Kick Plate	K1050 12" High	US32D	RO	
1	Electromagnetic Holder	998M	689	RF	⚡
1	Seal Kit	D-SS-STK-DBZ	Dark Bronze	RI	

Notes: All listed hardware by Section 081700 integrated door assembly manufacturer.

Set: 64.0
Doors: 202B, 306A, 402A, 502A, 607A, 702A, 802A
Description: Rated Elevator Cab Exit Pair - Integrated Door

2	Continuous Hinge	D300 83-1/8"	630	RI	

2	Recessed Exit	D3677	US32D	RI	
1	Lever Trim (passage)	D3080-01 -9	US32D	RI	
2	Surface Closer	7500ST-180	689	NO	
2	Kick Plate	K1050 12" High	US32D	RO	
2	Electromagnetic Holder	998M	689	RF	⚡
2	Seal Kit	D-SS44-STK-DBZ	Dark Bronze	RI	

Notes: Balance of hardware by Section 081700 integrated door assembly manufacturer.

Set: 65.0
Doors: 175
Description: Bi-Fold Pair

1	Sliding Door Hdwe	HF4/100A/6		PE
2	Door Pull	106-RKW Mtg-Type 1	US32D	RO

Set: 66.0
Doors: 012-1, 012-2
Description: Existing Doors, Frames & Hardware

1	Existing to Remain	No 087100 Hardware Required	OT

END OF SECTION 08 71 00

SECTION 08 72 10
AUTOMATIC DOOR OPERATORS

PART I: GENERAL

1.1 SUMMARY

A. WORK INCLUDED: Furnish complete automatic aluminum door operator system at Door M086D, as specified, that has been manufactured, fabricated and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

B. RELATED WORK:

1. Electrical: Division 26, applicable sections.
2. Storefront; Glass; Hardware: Division 8, applicable sections.

C. Work Included this Section:

1. Electric automatic swinging door operator and controls.

1.2 REFERENCES

A. AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA) 101: Appendix Dissimilar Materials.

B. AMERICAN ASSOCIATION OF AUTOMATIC DOOR MANUFACTURERS (AAADM).

C. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):

1. ANSI Z97.1: Safety Glazing Materials Used in Buildings -Methods of Test.

2. ANSI A 156.19: For Power Assist and Low Energy Power Operated Doors

D. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) B221: Aluminum Alloy Extruded Bars, Rods, Shapes and Tubes.

E. AMERICANS WITH DISABILITIES ACT (ADA) 1990

F. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) 101: Code for Safety to Life from Fire in Buildings & Structures.

G. THE ALUMINUM ASSOCIATION (AA) Aluminum Finishes Manual.

H . UNDERWRITERS LABORATORY, INC. (USA & CANADA) UL 325: Electrical Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.3 SUBMITTALS

A. PRODUCT DATA: Submit manufacturer's complete product and installation data.

B. SHOP DRAWINGS: Submit drawings showing layout, profiles, product components including anchorage, accessories, finish and glazing details (where required).

C. QUALITY ASSURANCE AND CLOSEOUT SUBMITTALS: Submit the following:

1. Manufacturer's Operation and Maintenance Data.
2. Warranty document as specified herein.
3. AAADM inspection compliance form completed and signed by certified AAADM inspector prior to doors being placed in operation as proof of compliance with ANSI A 156.19.

1.4 QUALITY ASSURANCE

A. INSTALLERS QUALIFICATIONS: Installer shall be factory trained, certified by AAADM, and experienced to perform work of this section.

B. MANUFACTURER'S QUALIFICATIONS: Manufacturer to have minimum (5) five years successful experience in the fabrication of automatic doors of the type required for this project. Manufacturer capable of providing field service representation during installation, approving acceptable installer and approving application method.

1.5 WARRANTIES

A. MANUFACTURER'S WARRANTY: Units to be warranted against defect in material and workmanship for a period of one year from the Date of Substantial Completion. Manufacturer's warranty is in addition to, and not a limitation of, other rights owner may have under Contract Documents.

B. DISTRIBUTOR'S WARRANTY: One-year warranty: Labor and transportation charges for defective parts replacement.

1.6 PROJECT CONDITIONS

A. FIELD MEASUREMENTS: Verify actual dimensions/openings by field measurements before fabrication and record on shop drawings. Coordinate to avoid construction delays.

1.7 DELIVERY, STORAGE AND HANDLING

A. ORDERING AND DELIVERY: Comply with factory's ordering instructions and lead time requirements. Delivery shall be in factory's original, unopened, undamaged containers with identification labels intact.

B. STORAGE AND PROTECTION: Provide protection from exposure to harmful weather conditions and vandalism.

PART II -PRODUCTS

2.1 MANUFACTURERS

A. HORTON AUTOMATICS, (Preferred Brand -Basis of Design) -Model 7000, TORMAX - Model TTX LCN- Model 9730.

2.2 EQUIPMENT

A. EASYACCESSTM HEADER: Shall be a side access extruded aluminum case running full width of door. Header shall be 4" x 6" (102 mm x 152 mm)

B. OPERATOR: The Electric Operating Mechanism shall be Series 7000. Maximum current draw shall not exceed 3.15 amps. Operator shall be mounted and concealed in an extruded aluminum case for smooth and quiet operation.

1. Opening action shall be accomplished by a 1/15 HP D.C. permanent magnet motor working through reduction gears to the output shaft.

2. Closing action shall be accomplished by a field replaceable spring. When the door is in the closing mode or fully closed, motor voltage shall not be required and will be off. The door can be manually operated with power on or off without damage to the operator. An On/Off/Hold Open switch shall be supplied.

3. Master Control: Shall incorporate the following features:

   a. Adjustable time delay of 2 to 30 seconds (ANSI A 156.19 requirement is 5 second minimum time delay).

   b. Infinite adjustment to opening and open check speeds including adjusting the opening force without affecting the opening speed.

   c. Immediate reversal of door motion without undue strain on the drive train. This too will be accomplished by supplying stepped voltage to the motor. The door shall reverse when closing if an object stops the door.

   d. Motor Protection Circuit: A locked door motor protection circuit will be supplied that will shut off current to the motor when the door is inadvertently locked or otherwise prevented from opening.

   e. Emergency Breakout for Inswinging doors (overhead concealed): When door is in emergency breakout position, power shall be removed from the operator.

C. OPERATION: Automatic and/or Manual:

1. Automatic: Pushbutton switch actuates door open; door closes after time delay expires. Opening and closing force, measured 1" (25.4 mm) out from the lock stile of the door, not to exceed 15 pounds (67 N) of force to stop the door when operating in either direction. Operator to include the following variable adjustments so as to comply with ANSI Standard A156.19: Opening speed -4 to 6 seconds; Closing speed -4 to 6 seconds.

D. MANUFACTURED DOOR UNITS:

1. EASY ACCESS Type 7100: Surface Applied Operator with Connecting Arms: The operator header shall be mounted to the surface of the existing door frame or wall. Connecting hardware shall be a double arm arrangement that can either push the door or pull the door open to suit the job condition. When the operator mounting is on the pull side and adjacent wall is within 4" (102 mm) of the door frame, specify a parallel arm.

2.3 RELATED EQUIPMENT

A. ACTIVATING DEVICE: Shall be located on each side of the opening as per ANSI Safety Standard A117. Activating device shall be one of the followings:

1. Push plate: Square 4 3/4" stainless steel switch embossed with PUSH TO OPEN and international handicap logo.

B. SAFETY DEVICE: Shall be located on the swing side of the opening mounted on door header to detect presence in the swing path of the door. Safety device shall be:

1. BodyGuard presence detector as manufactured by BEA INC. Furnish BodyMount Spacer.

2.4 RELATED WORK REQUIREMENTS

ELECTRICAL:

120 VAC, 60 cycle, 1 phase, 15-amp service routed into operator housing.
Single gang wall box and 18/2 wiring run in conduit routed into operator housing from push plate locations. (Item #2 can be deleted if radio control type devices are used.)

2.5 MATERIALS, FINISHES AND FABRICATION

A. EXTRUDED ALUMINUM: ASTM B221, 6063-T5 alloy and temper, anodized:

1. Structural Header Sections: Minimum 1/8" (3 mm) thickness.

B. FINISHES (for all exposed aluminum surfaces): Shall be one of the followings:

1. 204-R1 Clear: Arch. Class II Clear Anodized Coating, AA-MI2C22A31.

C. OPERATOR CONSTRUCTION: Electromechanical.

PART III -EXECUTION

3.1 EXAMINATION

A. SITE VERIFICATION OF CONDITIONS: Installer must verify that base conditions previously installed under other sections are acceptable for product installation according to with manufacturer's instructions. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of work. Do not start work until all negative conditions are corrected in a manner acceptable to the installer and manufacturer.

3.2 INSTALLATION

A. GENERAL: Install door units plumb, level and true to line, without warp or rack of frames or sash with manufacturer's prescribed tolerances. Provide support and anchor in place.

B. DISSIMILAR MATERIALS: Comply with AAMA 101, Appendix Dissimilar Materials by separating aluminum materials and other corrodible surfaces from sources of corrosion or electrolytic action contact points.

C. WEATHER-TIGHT CONSTRUCTION: Install header and framing members in a bed of sealant or with joint filler or gaskets. Coordinate installation with wall flashings and other components of construction.

D. ELECTRICAL: General or electrical contractor to install all wiring to operator on a separate circuit breaker routed into header.

3.3 CLEANING, ADJUSTMENT AND PROTECTION

A. CLEANING: After installation, installer to take following steps:

1. Remove temporary coverings and protection of adjacent work areas.
2. Remove construction debris from construction site and legally dispose of debris.
3. Repair or replace damaged installed products.
4. Clean product surfaces and lubricate operating equipment for optimum condition and safety.

B. ADJUSTMENT: AAADM certified technician shall inspect and adjust installation to assure compliance with ANSI A156.10.

C. ADVISE CONTRACTOR: Of precautions required through the remainder of the construction period, to ensure that doors will be without damage or deterioration (other than normal weathering) at the time of acceptance.

END OF SECTION 08 72 10

SECTION 08 80 00
GLASS AND GLAZING

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Sealants (Section 07 90 00).
2. Hollow metal doors (Section 08 11 00).
3. Wood doors (Section 08 14 00).
4. Aluminum Storefront Framing and Entry Doors (Section 08 41 10).
5. Exchange windows (Section 08 58 31).

B. Work Included This Section:

1. Glass and glazing as shown and specified.
2. All glass and glazing not specifically included in other Sections of the Specifications.
3. All accessory materials required for a complete and proper installation.

1.3 INDUSTRY STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

Underwriter's Laboratories Inc. (UL)
Flat Glass Marketing Association (FGMA)
National Bureau of Standards (NBS)
American Architectural Manufacturers Assn. (AAMA)

1.4 QUALIFICATIONS:

A. Manufacturers:

1. Standard: For purposes of designating type and quality for the work under this Section, Drawings and Specifications are based on products manufactured or furnished by manufacturers listed for specific products. Equal products by other manufacturers will be acceptable when approved in writing by the Architect.

2. Source: Products for use on this Project shall be one manufacturer for the same function unless noted specifically otherwise herein.

1.5 PRODUCT HANDLING:

A. Glazing compounds and accessories shall be delivered to the site in unopened containers, labeled plainly with the manufacturer's names and brands.

B. Glass and setting materials shall be stored in safe, dry locations and shall not be unpacked until needed for installation. Handling and installation of materials shall be in a manner that will protect them from damage.

1.6 ENVIRONMENTAL CONDITIONS:

A. Glazing work shall not be started until the outdoor temperature is above 40° F. on a rising thermometer, unless approved provisions are made to warm the glass and rabbet surfaces. Sufficient ventilation shall be provided to prevent condensation of moisture on glazing work during installation.

B. Glazing work shall not be performed during damp or rainy weather.

C. Glazing in gasket construction shall be governed by the requirements of the gasket manufacturer.

1.7 SUBMITTALS:

A. Shop Drawings: Show glazing with proposed setting systems for various glass framing and types of glass. Show relation to adjacent work. Show installation techniques and materials with large scale detail drawings.

B. Manufacturer's Data: Submit (in duplicate) manufacturer's printed data and installation instructions for each of the glass types specified hereinafter for approval before work is started.

C. Samples: Submit 12" x 12" factory labeled samples of each type of glass specified and representative samples of glazing materials and accessories specified or proposed to be used.

D. Guarantees:

1. Submit a 10-year guarantee on all glass specified in this Section. The guarantee shall include, but not be limited to, the following:

   a. Water leaks.
   b. Breakage due to faulty installation or thermal failures.
   c. Delamination of glass and coating.
   d. Spontaneous breakage of tempered glass and all other glass types.
   e. Loose or faulty installation.
   f. Noncompliance with ANSI Standard Z97.1
   g. Labels or identification in exposed to view areas, except for those required by code or governing authorities.
   h. Failure to meet performance requirements of Specification.

2. Insulating glass units shall be guaranteed not to develop material obstruction to vision as a result of dust or condensation in the air space area or any other failure of the hermetic seal, other than through glass breakage, within a 10-year period following installation. Any units failing to comply with terms of this guarantee shall be replaced at no additional cost to the Owner. Submit guarantee bearing name of Owner, project, installer and date of final acceptance.

E. Internal Stress Calculations: For each type of glass used on the exterior of the building, submit calculations by the glass manufacturer or fabricator showing internal stresses to be expected in the glass under direct sunlight, instantaneous differential shading, and other stressful environmental conditions that will exist after completion of the building. These calculations should illustrate that the glass, when installed as shown and specified, will not develop internal stresses of such magnitude that spontaneous breakage will occur. If the Contractor fails to notify the Architect, in writing with this submittal, that spontaneous breakage due to internal stresses is likely to occur if the glass is installed as shown and specified, then the Contractor will be responsible in the event that spontaneous breakage does occur.

PART 2: PRODUCTS

2.1 MATERIALS:

A. Types of Glass: See Paragraph "Locations of Glazing Types" in Part 3 of this Section for locations of glass types specified below.

1. Type I - Float Glass: (Not Used)

2. Type II- Clear Tempered Float Glass:

a. Tempered, 1/4" thick, clear, float glass, ASTM C 1048, Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), Kind FT (fully tempered). One of the following manufacturers, or equal approved in writing by the Architect:

Guardian Industries
Pilkington LOF
PPG Industries.
Old Castle

3. Type III - Tinted Tempered Float Glass:

a. Tempered, tinted, heat-absorbing, glare reducing 1/4" thick float glass, ASTM C 1048, Type I (transparent glass, flat), Class 2 (tinted, heat absorbing and light reducing), Quality q3 (glazing select), Kind FT (fully tempered). One of the following manufacturers, or equal approved in writing by the Architect:

Guardian Industries
Pilkington LOF
PPG Industries.
Old Castle

b. Tint Color: ("Azurlite" by PPG Industries) (Blue) (Blue-green) (Bronze) ("Evergreen" by Libbey-Owens-Ford) (Green) (Gray) (Other tint color as selected for the Project), providing the following performance properties:

Visible Light Transmittance: (Insert single percentage or range)
Solar Heat Gain: (Insert single value or range)
Outdoor Visible Reflectance: (Insert single percentage or range)

4. Type IV - Insulating Tinted Tempered Float Glass:

a. Shall consist of one exterior lite of 1/4" thick tinted tempered float glass, 1/2" dehydrated air space and one interior lite of 1/4" thick tinted tempered float glass. Insulating glass is to have low-E coating on the No. 2 or No. 3 surface, and a maximum SHGC of 0.25.

b. Insulating glass shall comply with ASTM E 774, Class CBA, and shall have hermetically sealed air space separated by metal spacer. Spacer shall be sealed type with soldered solid corners or corner keys and shall contain desiccant in 3 of the perimeter spaces.

c. Shall be one of the following manufacturers, or equal approved in writing by the Architect:

Guardian Industries
Pilkington LOF
PPG Industries
Old Castle

d. Tint Color: ("Azurlite" by PPG Industries) (Blue) (Blue-green) (Bronze) ("Evergreen" by Libbey-Owens-Ford) (Green) (Gray) (Other tint color as selected for the Project), providing the following performance properties:

Visible Light Transmittance: (Insert single percentage or range)
Solar Heat Gain: (Insert single value or range)
Outdoor Visible Reflectance: (Insert single percentage or range)

5. Type V - Bullet Resistant Glass:

a. Shall be multi-layered clear annealed glass laminated with polyvinyl butyral interlayer, 1 3/16" thick, meeting the requirements of ANSI Z97.1 and Federal Specification 16 CFR 1201, Category I and II and shall be Underwriters Laboratories listed.

b. One of the following, or equal approved in writing by the Architect.

BR-136 Bullet Resistant Glass by Globe Amerada Inc.
D-FenceBRGlass by Advanced Glass Systems Inc.
Laminated Bullet Resistant Glass by Laminated Glass Corp.

6. Type VI - Fire-Rated Glass:

a. Fire-Protection Rating: As indicated for the fire lite in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction. Similar to 5/16" Firelite Plus as manufactured by Technical Glass Products, and SuperLite II xl by SAFTI Glass or approved equal. See Drawings for locations.

6. Type VII – Insulating Tinted Tempered Translucent Float Glass (Women 169):

a. Shall consist of one exterior lite of 1/4" thick tinted tempered float glass, 1/2" dehydrated air space and one interior lite of 1/4" thick translucent tempered float glass. Insulating glass is to have low-E coating on the No. 2 or No. 3 surface, and a maximum SHGC of 0.25.

b. Insulating glass shall comply with ASTM E 774, Class CBA, and shall have hermetically sealed air space separated by metal spacer. Spacer shall be sealed type with soldered solid corners or corner keys and shall contain desiccant in 3 of the perimeter spaces.

B. Elastomeric Glazing Sealants and Preformed Glazing Tapes:

1. General: Provide products of type indicated and complying with the following requirements:

a. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.

b. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.

c. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.

d. Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

2. Preformed Butyl-Polyisobutylene Glazing Tape: Provide manufacturer's standard solvent-free butyl-polyisobutylene formulation with a solids content of 100 percent; complying with AAMA A 804.1; in extruded tape form; non-staining and non-migrating in contact with nonporous surfaces; packaged on rolls with a release paper on one side; with or without continuous spacer rod as recommended by manufacturers of tape and glass for application indicated.

C. Glazing Gaskets:

1. Lock-Strip Gaskets: Neoprene extrusions of size and shape indicated, fabricated into frames with molded corner units and zipper lock strips, complying with ASTM C 542; black.

2. Dense Elastomeric Compression Seal Gaskets: Molded or extruded gaskets of material indicated below, complying with ASTM C 864, of profile and hardness required to maintain watertight seal:

Neoprene
EPDM
Thermoplastic polyolefin rubber
Any material indicated above

3. Cellular Elastomeric Preformed Gaskets: Extruded or molded closed cell, integral-skinned neoprene of profile and hardness required to maintain watertight seal; complying with ASTM C 509, Type II; black.

D. Miscellaneous Glazing Materials:

1. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.

2. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

3. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 shore A durometer hardness.

4. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.

5. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.

6. Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, flexible and resilient, with 5-10 psi compression strength for 25 percent deflection.

E. Adhesive for Mirrors: Type recommended by the mirror manufacturer and equal to Pecora No. 7HR4 special back bedding compound.

F. Manufacturer's Labels:

1. Labels showing strength, grade, thickness, type and quality will be required on each piece of glass. Labels must remain on glass until it has been set and inspected.

2. When glass is not cut to size by the manufacturer and it is furnished unlabeled from local stock, the Contractor shall submit an affidavit stating the quality, thickness, type and manufacturer of the glass furnished.

PART 3: EXECUTION

3.1 INSTALLATION:

A. Glazed Openings - General:

1. Do not set glass until rabbets of metal and wood have been primed nor until prime coat is dry.

2. Remove greases, lacquers and other organic protective finishes from surfaces of aluminum receiving glazing compound.

3. All glazing shall be done in accordance with the "Glazing Manual" and "Sealant Manual" of the Flat Glass Marketing Association. Use setting blocks. Observe clearance requirements of manufacturer of tempered, tinted and insulating glass and as recommended in the FGMA Glazing Manual.

4. Where resilient gaskets are furnished with the doors or framing members, install glass in accordance with written instructions of manufacturer of glazing section.

5. Install glazing materials and accessories in accordance with printed installation instructions of manufacturer.

6. Glass sizes shall be field measured to provide the required edge clearances for the type of glass to be installed.

7. Glazing work shall produce sealed weathertight installation. At completion of work, leave glass clean, tightly placed, whole and free from cracks and rattles.

8. Unless recommended otherwise in writing by the glass manufacturer, glazing detailed with butted vertical joints shall have a 1/8" wide vertical joint filled with the sealant specified in Section 07 90 00. Sealant shall be slightly regressed from radiused ground edge.

9. In other Sections of the Project Manual where glazing is specified to be furnished and installed under those Sections, more stringent installation requirements may be specified and shall govern the glazing installation within that Section.

B. Glazing for Hollow Metal Frames:

1. Install glazing units on 2 resilient neoprene setting blocks spaced at quarter points of sill and of sufficient length to support glazing. Height of setting blocks must be adjusted for proper perimeter clearance.

2. Apply pre-shimmed glazing tape at exterior face of glass prior to setting glass in place. Apply tape in one continuous piece with joint at top of glass. Apply glazing tape accurately to allow for a minimum of 1/8" silicone sealant joint.

3. Provide heel bead silicone sealant at sill corners.

4. Install glazing bead with neoprene compression gasket on interior face of glass.

5. Lock windows into place after glazing.

C. Aluminum Storefront Glazing:

1. Install glazing units on 2 resilient neoprene setting blocks spaced at quarter points of sill and of sufficient length to support glazing. Height of setting blocks must be adjusted for proper perimeter clearance.

2. Install with glazing gasket provided by storefront manufacturer and in strict accordance with glazing and storefront manufacturer's written instructions.

3. Unless recommended otherwise in writing by the glass manufacturer, butted vertical glass joints shall be fitted to within 1/16" and sealed with silicone sealant the entire height and thickness of the joint.

D. Interior Glazing:

1. Install glass in frames not having glazing gaskets, using glazing compound or glazing tape and setting blocks. Install in accordance with manufacturer's printed instructions. Glazing shall not be installed against bare metal surfaces.

3.2 LOCATION OF GLAZING TYPES:

A. See Drawings for specific locations of glazing types. Glass types locations are shown on the Drawings, however if a glass type shown is in conflict with the requirements of the NC State Building Code, the more stringent requirement shall be used.

3.3 WATER TESTS: See Section 08 41 10 for water tests required for the aluminum storefront system.

3.4 CLEANING:

A. Upon approval of Architect, remove all labels and thoroughly clean all glass.

B. Remove glazing materials from adjacent surfaces with cleaner recommended by the manufacturer for each specific material.

END OF SECTION 08 80 00

SECTION 09 29 00
GYPSUM DRYWALL

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Wood framing, furring and blocking (Section 06 10 00).
2. Flexible insulation including acoustical (Section 07 21 10).
3. Rigid insulation (Section 07 21 30).
4. Painting (Section 09 91 00).
5. Compressible filler at top of non-fire-rated and fire-rated walls (Sections 07 21 10 and 07 84 00 respectively)

B. Work Included This Section:

1. Metal framing and furring for GWB ceilings and non-load-bearing interior GWB partitions.

2. Gypsum wallboard partitions, shaftwalls, ceilings and elsewhere as indicated or specified.

3. All trimwork and other accessories required for a complete and finished installation.

1.3 SUBMITTALS:

A. Manufacturer's Data: Submit in duplicate.

1. Manufacturer's technical data on materials and instructions for installing gypsum wallboard partitions and ceilings including light gauge metal framing.

1.4 PRODUCT HANDLING:

A. Delivery and Storage:

1. Deliver products in original wrapping and containers with labels intact.

2. Store gypsum products as recommended by manufacturer to prevent damage and wetting.

3. Store metal items in a dry location free from physical abuse.

PART 2: PRODUCTS

2.1 MANUFACTURERS: To identify type and quality of materials and workmanship intended, specifications are based on the products of manufacturers listed. Products and systems as manufactured by the listed companies will be acceptable when submittals specified hereinafter are approved by Architect in writing.

A. Gypsum Board and Related Products:

Gypsum Division of Georgia-Pacific
National Gypsum Company
BPB (formerly Celotex)
United States Gypsum Company

B. Steel Framing, Furring and Related Products:

Dietrich Industries Inc.
Marino Industries Corp.
United States Gypsum Company

2.2 MATERIALS:

A. Suspended Grid for Ceilings:

1. Comply with UL Design P508.

2. Cross furring channels shall be Type DWC hat-shaped furring channel, minimum 25-gauge galvanized steel.

B. Lightweight Framing:

1. Steel Studs for Non-Load-Bearing Interior Partitions: Cold-rolled from 20-gauge galvanized steel and designed for screw attachment of wallboard. Note UL gauges listed on the drawings are a minimum requirement, heavier gauge is required by this Specification. Studs at all door jambs and jambs at any wall opening over 3'-0" wide shall be doubled. Provide floor and ceiling runners of same gauge material as studs. See Drawings for stud sizes and shapes.

   a. Studs for shaft wall systems shall be 20-gauge galvanized USG Steel C-H Studs, or approved equal, with overall width shown on the Drawings or if not shown the manufacturer's standard width suitable for the indicated construction conditions. J-Runners, jamb struts and other required framing members shall be same gauge and finish as the studs.

C. Gypsum Wallboard: Provide thicknesses shown on the Drawings. For locations of the various types, see paragraph titled "Locations" in Part 3 of this Section.

1. Standard Wallboard: USG Sheetrock SW, with tapered edges.

2. Water Resistant Wallboard: USG Sheetrock W/R Gypsum Panels.

3. Fire Rated Wallboard: USG Sheetrock Firecode Type X per ASTM C 1396.

4. Gypsum Wallboard with Vapor Barrier: Aluminum Foil-Back USG Sheetrock with vapor permeability not to exceed 0.06 perm per ASTM C 355.

5. Shaft Wall Liner Panels: 1" thick USG Gypsum Liner Panels complying with ASTM C 1396.

6. Cement Board: USG Durock Interior Cement Board, Wonder-Board by Modulars Inc., or equal approved in writing by the Architect.

D. Screws:

1. Wallboard: As recommended by manufacturer for specific application.

2. Steel Framing: Pan-head sheet metal screws, steel, cadmium-plated.

E. Hanger Wire: No. 8 galvanized steel wire.

F. Tie Wire: No. 18.

G. Metal Trim: No. 200A or 200B.

H. Corner Bead: Dur-A-Bead No. 103.

I. Control Joint: Control Joint No. 093.

J. Joint Compound:

1. For Cementing Tape: Durabond 90.

2. For Fill Coats: Ready Mixed Joint-Compound All-Purpose.

K. Joint Tape: Perf-A-Tape.

L. Wallboard Adhesive: Durabond 90 for double layer wallboard application.

M. Caulking Compound/ Acoustical Sealant: USG Acoustical Sealant.

N. USG Metal Z Furring Channel shall be of galvanized steel and of depth shown to allow thickness of rigid wall insulation or air space shown on Drawings.

O. Acoustical Ceiling Hangers: Model WHD Neoprene Hanger by Mason Industries Inc., or similar and equal type by Industrial Acoustics Co. or Peabody Noise Control Inc. when approved by the Architect.

P. Acoustical Angle Bracket: Model AB-716 Angle Brace by Mason Industries Inc., or similar and equal type by Industrial Acoustics Co. or Peabody Noise Control Inc., when approved by the Architect. Angle to be 1 1/2" x 2" x manufacturer's standard thickness with 3/8" thick sponge adhered to outside of the 2" leg and with pre-punched holes in the 1 1/2" leg.

PART 3: EXECUTION

3.1 PRE-INSTALLATION MEETING:

A. Approximately one week prior to commencement of work, Contractor is to schedule a pre-installation meeting.

B. Meet at the site with drywall installer, Architect, Owner and other representatives directly concerned with performance of the work.

C. Contractor is to conduct the meeting with input from Architect and Consultants.

D. Inspect and discuss condition of substrate and other preparatory work performed by other trades.

E. Contractor to record discussions of conference, including decisions and agreements (or disagreements) reached, and furnishes copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.

F. Contractor to distribute minutes to all parties concerned.

3.2 INSTALLATION GENERAL:

A. Follow manufacturer's printed instructions and recommendations of the USG's Gypsum Construction Handbook (latest edition).

3.3 INSTALLATION OF LIGHTWEIGHT FRAMING AND FURRING:

A. Follow manufacturer's printed instructions and recommendations of the USG's Gypsum Construction Handbook (latest edition). Observe details on Drawings. Framing shall be secure, rigid and with connections sufficiently strong to carry applied loads with a 2-to-1 safety factor.

B. Work shall be plumb, level and true to line within a tolerance of plus or minus 1/8" in 10'-0" and with no abrupt deviations.

C. Unless otherwise detailed on the Drawings, where GWB partitions are extended to the underside of the building structure above, the metal framing shall be held down 1/2" from the structure to allow for deflection of the structure. The space shall be filled with batt insulation specified in Section 07 21 10 for non-fire-rated walls and fire stopping specified in Section 07 84 00 for fire-rated walls and sealed as specified or shown for the particular wall type.

3.4 GENERAL REQUIREMENTS FOR INSTALLATION OF GYPSUM WALLBOARD:

A. Minimum temperature in space shall be 50 deg. F. and building shall be enclosed with all exterior doors and windows in place before beginning GWB work.

B. All ends, and edges of all gypsum wallboard shall occur over supporting members. To minimize end joints, use wallboard of maximum practical lengths. Boards shall be brought into contact but shall not be forced into place. Where ends or edges abut they shall be neatly fitted.

C. End joints on vertical surfaces shall be staggered. Joints on opposite sides of partitions shall be arranged so as to occur on different studs. Joint layout at openings shall be made so that no end joints will align with edges of opening. Joints in multi-layer work shall be staggered so that joints in one layer will not occur over joints in second layer.

D. For acoustical walls containing sound absorbing insulation between studs, install caulking at floor, ceiling, partition perimeters and where partitions abut different material. Install caulking around openings cut in wallboard partitions for doors, windows, ducts, electrical boxes or others. Install caulking as recommended by manufacturer of wallboard.

E. Apply metal trim at exposed edges of wallboard, at exposed external corners and edges abutting dissimilar materials.

F. Openings cut in wallboard to fit electrical outlets, plumbing, piping, etc., shall fit snugly and shall be small enough to be covered by standard size plates and escutcheons. Both face and back paper shall be cut for all cutouts which are not made by use of a saw.

G. Where wallboard is shown on the Drawings to be extended to building structure above, it shall follow the profile of the structure and the joints shall be bedded and taped. Sanding of joints above ceiling is not required.

3.5 SUSPENSION SYSTEM:

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 16 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.

a. Do not attach hangers to steel roof deck.

b. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.6 FURRING CHANNELS:

A. Wire tie furring channels to supports. Space furring channels at 1'-4" o.c. unless shown otherwise on the Drawings. Overlap splices of furring channels 5 1/2". Secure with 2 double strand ties. Minimum end clearances at walls for furring channels shall be 3/8".

3.7 APPLICATION OF FIRE RATED WALLBOARD:

A. Where the Drawings show fire rated wallboard and reference a specific UL Design Number, the application of wallboard to the substrate shall be exactly as specified in the UL or other publication for the referenced Design Number, including the types and spacing of all anchors.

3.8 APPLICATION OF WALLBOARD ON FURRING CHANNELS:

A. Attach wallboard with long dimension at right angles to main furring channels. Secure wallboard to furring channels with screws at 8" at perimeters and 12" in the field of the panels.

B. All screws shall be power-driven with an electric screw driver. Screw heads shall provide a slight depression below surface of board without cutting paper.

3.9 APPLICATION OF WALLBOARD ON STEEL STUDS:

A. Provide single-layer vertical application of gypsum panels and space screws 12" o.c. in field of panels and 8" o.c. staggered along vertical abutting edges.

B. For double-layer laminated construction, attach base layer with 1" Type S screws spaced 8" o.c. at joint edges and 12" o.c. in field. Apply face layer vertically with adhesive on back side, joints staggered approximately 12" and fastened to base layer with 1 1/2" Type G screws. Drive screws approximately 2' from ends and 4' o.c. in field of panel, 1' from ends and 3' o.c. along a line 2" from vertical edges. Temporary shoring or support installed 16" to 24" o.c. until adhesive is dry may be used in place of screws.

1. In lieu of using adhesive, both layers may be screw attached as follows: attach the base layer with screws at 12" o.c. both at the perimeter and field of the panel and then attach the face layer with screws 12" o.c. both at the perimeter and field of the panel.

3.10 INSTALLATION OF SHAFT WALL SYSTEMS:

A. Examination:

1. Examine substrates which gypsum board shaft wall construction attaches to or abuts including preset hollow metal frames, elevator hoistway door frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of shaft wall construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Preparation:

1. Before sprayed-on fireproofing is applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fireproofing. Where offset anchor plates are required, provide continuous units fastened to building structure not more than 24 inches o.c. and to ceiling runners.

2. After sprayed-on fireproofing has been applied (if applicable), remove only as much fireproofing as needed to complete installation of shaft wall systems. Protect fireproofing that remains from damage. Comply with shaft wall manufacturers requirements for replacement of fireproofing as required to re-establish its continuity.

C. Installation of Gypsum Board Shaft Wall Systems:

1. General: Install gypsum board shaft wall systems to comply with performance and other requirements indicated as well as with manufacturer's installation instructions and the following:

a. ASTM C 754 for installation of steel framing.

b. Comply with requirements specified elsewhere in this Section for application and finishing of shaft wall liner panels and gypsum wallboard.

2. Coordinate gypsum board shaft wall construction with sprayed-on fireproofing of the structure, (if applicable), so that both remain complete and undamaged. Patch or replace sprayed-on fireproofing removed or damaged during the installation of the shaft wall system.

3. At penetrations in shaft wall, maintain fire resistance rating of entire shaft wall assembly by installing supplementary fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

4. Isolate shaft wall system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading. Comply with details shown and with manufacturer's instructions.

5. Seal gypsum board shaft walls at perimeter of each section which abuts other work and at joints and penetrations within each section. Install acoustical sealant to withstand dislocation by air pressure differential between shaft and external spaces; comply with manufacturer's instructions and ASTM C 919.

D. Protection:

1. Provide final protection and maintain conditions in a manner acceptable to installer, which ensures gypsum board shaft wall system construction being without damage or deterioration at time of Substantial Completion.

3.11 METAL TRIM AND CORNER BEADS: Installation of trim and corner beads shall be straight, plumb and uniformly spaced along adjacent work. Fasten securely as recommended by manufacturer of trim.

A. At outside corners, embed one layer of joint tape in joint compound at each leg of the corner bead, in addition to the normal application of joint compound, to prevent a concave area on each side of the corner bead when the joint compound dries and cures.

3.12 FINISHING:

A. Joint Treatment: Embed tape in cementing compound. Cover with 3 applications of fill coat in accordance with the Gypsum Association Level 4 Gypsum Board Finish Requirements. (use Level 5 under critical lighting conditions or when glossy paint is used) Install materials in accordance with manufacturer's printed instructions to produce smooth, inconspicuous joints and well filled to prevent ridging. Avoid raising nap on wallboard when sanding down fill coats.

B. Metal Trim and Corner Beads: Extend embedded tape to face of edge or corner ground and terminate. Finish similar to wallboard joints.

C. Wallboard Face Repair: Repair and finish all attachment heads, depressions and minor wallboard face imperfections with material and as recommended by the manufacturer.

3.13 CONTROL JOINTS:

A. Provide control joints at locations shown on the Drawings and if not shown at maximum spacing given in table titled "Max. Spacing USG Control Joints" included in the U. S. Gypsum Construction Handbook, latest edition.

3.14 LOCATIONS: Unless shown otherwise on the Drawings, use the specified materials in the following general locations:

A. Standard Wallboard: At locations not specified otherwise.

B. Water Resistant Wallboard: Substrate for ceramic tile in locations other than showers.

C. Fire Rated Wallboard: Where rated partitions or ceilings are shown on the Drawings.

D. Gypsum Wallboard with Vapor Barrier: All exterior walls and GWB ceilings with unheated space above.

E. Shaft Wall Liner Panels: At mechanical chases and elsewhere as shown on the Drawings.

F. Cement Board: Substrate for ceramic tile walls and ceilings in showers.

END OF SECTION 09 29 00

SECTION 09 30 00
CERAMIC TILE

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Tolerances in concrete substrate (Section 03 30 00).
2. Toilet accessories (Section 10 81 00).
3. Floor drains (Division 22).
4. Cement board and water-resistant gypsum board substrates for ceramic tile (Section 09 29 00).
5. Sealants (Section 07 90 00)

B. Work Included This Section:

1. Ceramic tile as shown on Drawings, and as specified and all accessories and supplementary materials required for a complete and proper installation.

1.3 INDUSTRY STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

Tile Council of North America (TCNA)
American National Standards Institute Inc. (ANSI)
The American Society for Testing and Materials (ASTM)

1.4 PERFORMANCE REQUIREMENT:

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028.

1. Level surfaces: Minimum 0.6
2. Ramp surfaces: Minimum 0.8

1.5 SUBMITTALS:

A. Samples: Submit the following samples.

1. Tile samples for initial selection: Manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors, textures, and patterns available for each type of tile indicated. Include Samples of accessories involving color selection.

2. Grout samples for initial selection: Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.

3. Samples for Verifications:

a. Panels of not less than 4 tiles, including grout, for each color and type of tile selected for the Project.

b. Full size units of each type of trim and accessory for each color selected for the Project.

c. Stone thresholds in 6-inch lengths for each color selected for the Project.

B. Manufacturer's Data:

1. Submit (in duplicate) manufacturer's product data for each type of tile, mortar, grout, and other products specified.

2. Submit (in duplicate) manufacturer's printed installation instructions for the types of tile installation specified hereinafter in this Section.

C. Certificates: Furnish Master Grade Certificate Bearing Certification Mark of Tile Council of America, signed by manufacturer and tile subcontractor stating type and quality of material furnished for the Project.

1.6 QUALITY ASSURANCE:

A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.7 PRODUCT HANDLING:

A. Delivery: Deliver materials to Project Site in manufacturer's original packages and with seals unbroken. Only tile which bears Certification Mark of Tile Council of North America on each carton will be permitted. Maintain package seals until time for installation.

B. Storage:

1. Store cementitious material in a dry building, on platforms, off floor and in an area free from wetting.

2. Store tile and accessory materials in a clean, dry, covered area to prevent wetting or staining.

1.8 ENVIRONMENTAL CONDITIONS:

A. Temperature: Mortar shall not be applied to surfaces that contain frost. Minimum temperature for installation of tile shall be 40^{o} F. and rising.

B. Ventilation: Movement of air shall be controlled to prevent rapid evaporation of moisture for mortar in place.

1.9 PROTECTION:

A. Traffic Restrictions: Spaces in which tile is being installed shall be closed to traffic and other work during installation and for at least 48 hours after completion of tile work.

B. Protect installed tile work with suitable covering during construction period to prevent staining, damage, and wear.

PART 2: PRODUCTS

2.1 ACCEPTABLE TILE MANUFACTURERS: Subject to compliance with the Drawings and Specifications and written approval by the Architect of the specified submittals, products by the following manufacturers will be acceptable for the Project:

American Olean Tile Company
Dal-Tile Corp.
Mannington Ceramic Tile
Quarry Tile Company
Summitville Tiles Inc.

A. Acceptable Setting and Grouting Manufacturers: Subject to compliance with the Drawings and Specifications and written approval by the Architect of the specified submittals, products by the following manufacturers will be acceptable for the Project:

American Olean Tile Company
Boiardi Products Corporation
Dal-Tile Corporation
Laticrete International, Inc.
Mapei Corporation
Southern Grouts and Mortars
Summitville Tiles Inc.
TEC Incorporated
WR Bonsal Company

B. Source: Products for use on this Project shall be of one manufacturer for the same function unless noted specifically otherwise herein.

2.2 MATERIALS:

A. Portland Cement: ASTM C 150, Type I, gray or white as required.

B. Lime: Hydrated lime conforming to ASTM C 207, Type S.

C. Sand: Clean, conforming to ASTM C 144. Fine aggregate (where required) shall pass 100% through a 16-mesh screen.

D. Latex Additive: Laticrete Liquid No. 3642, as mfd. by Laticrete International Inc. or equal. (used with job-mixed Portland cement mortar only)

E. Water: Potable.

F. Reinforcing: 2" x 2" x 16/16-gauge welded wire mesh, galvanized.

G. Bond Coat: Portland cement paste on a plastic bed, or dry-set mortar or latex Portland cement mortar on a cured bed.

H. Organic Adhesive: ANSI A136.1, Type I.

I. Cleavage Membrane: 15 lb. roofing felt or 4 mil polyethylene film.

J. Metal Wall Lath: Shall be flat rib lath, 3.4 lbs. per sq. yd.

K. Dry-Set/ Thin Set Portland Cement Mortar:

1. Mortar shall comply with requirements of ANSI Standard A118.4

2. Mortar shall be factory prepared mixture of Portland cement; dry redispersible, latex additive; and other ingredients to which only water needs to be added at Project site.

3. Mortar shall be manufactured by one of the companies listed as “Acceptable Setting and Grouting Manufacturers” in Part 1 of this Section, or equal approved in writing by the Architect.

L. Grouting Material:

1. Grout shall comply with ANSI Standard A118.6.

2. Grout shall be factory-prepared mixture of Portland cement; dry redispersible, latex additive; and other ingredients to produce the following:

   a. Unsanded grout mixture for joints 1/8” and narrower.

   b. Sanded grout mixture for joints wider than 1/8”

3. Grout shall be manufactured by one of the companies listed as “Acceptable Setting and Grouting Manufacturers” in Part 1 of this Section, or equal approved in writing by the Architect.

4. Color shall be as selected by Architect.

M. General Requirements for Tile:

1. Tile shall be as manufactured by companies listed below, or other manufacturer listed in Paragraph "Acceptable Tile Manufacturers" hereinbefore in this Section, or equal approved in writing by the Architect, and shall be "Quality Certified" by the Tile Council of North America Inc. to equal or exceed the Standard Grade requirements of ANSI Standard A137.1. Only tile which bears Certification Mark of the Tile Council of North America on each carton will be permitted.

2. See Drawings Room - Finish and Color Schedule, for tile locations, details and colors.

3. Provide colors of tile as selected by the Architect from the tile manufacturer’s full line of colors. (Not from standard colors only) at no additional expense to the Owner.

4. Glazed Wall Tile:

   a. Standard Grade, 4 1/4" x 4 1/4" x 5/16”.

   b. Wall Trim Shapes: Provide cap and external bullnose corners.

   c. Tile Base: Profile indicated on the Drawings and shall be furnished by the manufacturer of the wall tile.

   d. Price Groups: The Architect will select the final colors of wall tile, however for pricing purposes, include 80% of wall tile in Price Group 2 and 20% of wall tile in Price Group 4.

5. Ceramic Mosaics:

   a. Standard Grade, 2" x 2" x 1/4" porcelain, cushioned edge.

   b. Mount tile in sheets for field. Paper-face-mount floor tile.

   c. Furnish trim shapes as shown on Drawings and as required by installation.

   d. Colors and Patterns: The Architect will select the final colors of floor tile, however, for pricing purposes include two colors, 50% Price Group 2 and 50% Price Group 4, in a checkerboard pattern

6. Porcelain Floor Tile:

   a. Standard Grade, 12" x 12" thru body unpolished porcelain tile.

   b. Tile shall be equal to Porcealto by Daltile.

   c. Colors and Patterns: The Architect will select the final colors of floor tile, however, for pricing purposes include two colors, price group I.

   d. Location: Porcelain tile to be provided in Vestibule 100, Lobby 101, Waiting 102, FR Kiosk 103 and Waiting 186. See Drawings A2.7, detail 2706 for pattern.

7. Ceramic Wall Base:

   a. TCNA Standard Grade, 4" high x 6" wide with radius top and cove bottom and shall be furnished by the manufactures of the wall tile. See the Drawings Room Finish and Color Schedule for other information. Wall base tile shall meet same physical property requirements specified above for floor and wall tile.

8. Porcelain Tile Wall Base:

   a. 4” high x 8” wide straight base by tile manufacture.

N. Stone Saddle: Amco White as produced by Georgia Marble Co., or equal approved in writing by the Architect, by other acceptable manufacturers listed hereinbefore in this Section. Profiles as shown on Drawings.

2.3 MIXING MORTARS AND GROUTS:

A. Mixing Liquid: Add water to latex additive only as recommended by manufacturer's printed instructions.

B. Portland Cement Mortar Setting Bed for Floors: One (1) part Portland cement to five (5) parts dry sand and 1/10-part hydrated lime (lime is optional), by volume. Add mixing liquid to obtain a consistency or workability to promote maximum density as evidenced by a smooth, slickened appearance when stroked with a trowel.

C. Dry-Set/ Thin Set Mortar: Mix in strict accordance with written instructions of mortar manufacturer.

D. Grout for Tile: Mix in strict accordance with manufacturer's written instructions.

E. Acceptable Setting and Grouting Manufacturers: Subject to compliance with the Drawings and Specifications and written approval by the Architect of the specified submittals, products by the following manufacturers will be acceptable for the Project:

Mapei Corporation
TEC Incorporated
WR Bonsal Company

2.4 WATERPROOF MEMBRANE:

A. Provide products that comply with ANSI A118.10.

B. All installations, where required in Part 3 of this Section by the Tile Council of North America's (TCNA) Handbook for Ceramic Tile Installation written instructions, shall have waterproof membrane. All ceramic tile floors above grade shall have waterproof membrane on the structural concrete slab prior to installation of ceramic tile. Above grade shall include all floors of a multi-level structure above the first floor, and any elevated slabs on the first floor.

C. Provide Hydroment-Ultra-Set by Bostik, or equal approved in writing by the Architect. This product is to be used as a waterproofing membrane only, and not to be used as a tile setting adhesive.

D. Waterproof membrane is to be turned up walls nominal 6" height.

E. See flood testing requirement included in Part 3 of this Section.

2.5 SHOWER LINING:

A. Provide shower liners in accordance with the North Carolina Plumbing Code at all showers.

B. Liners shall be one of the following:

1. Plasticized Polyvinyl Chlorine (PVC) sheets a minimum 0.040 inches (1.02mm) thick meeting requirements of ASTM D4551. Join sheets by solvent welding per manufacturer's installation instructions

2. Chlorinated Polyethylene (CPE) sheets. Non-plasticized chlorinated polyethylene sheets shall be a minimum 0.040 inches (1.02mm) thick meeting the requirements of ASTM D4068. Liners shall be joined per manufacturer's installation instructions.

PART 3: EXECUTION

3.1 CONDITION OF SURFACES:

A. Examine surfaces to receive tile. Work shall not be started until defects have been corrected that will adversely affect tile work.

B. Surfaces to receive tile shall be dry, clean, and free of oily or waxy films, firm, level and plumb.

C. Work shall not be started until work of other trades which goes in or behind tile has been completed.

D. In areas to receive thin set tile, substrate shall not vary more than 1/8" in 8'-0" from true plane.

3.2 WATERPROOFING MEMBRANE:

A. Installation to comply with waterproofing membrane manufacturer's written instructions to produce a waterproof membrane of uniform thickness bonded securely to substrate.

B. Flood Test: Do not start tile installation until waterproof membrane has been installed and successfully passed flood test. The fluid applied waterproofing membrane shall be installed in accordance with requirements of the manufacturer. Flood test shall consist of sealing off area, stopping drains and flooding with 2" to 3" of water. Waterproofing system must retain water depth for a period of 8 hours. If leakage occurs, drain area, repair leaks and repeat flood test until no leaks appear in an 8-hour period.

3.3 SHOWER LINING:

A. Install liners in compliance with the North Carolina Plumbing Code and manufacturer's written installation instructions.

B. Coordinate with ceramic tile installation.

3.4 INSTALLATION OF TILE:

A. General Requirements for Installation of Tile:

1. Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated for tile installation.

2. Comply with Tile Council of North America's "Handbook for Ceramic Tile Installation", methods indicated for tile installation.

3. Fitting: Cut and drill tile for proper fitting around work projecting through wall so that escutcheons and collars will overlap cuts. Rub exposed, cut edges.

4. Pattern: Lay out tile lengthwise on walls so that no tile of less than half size occurs.

5. Base: Floor level at wall shall be at a constant elevation all around room such that wall base will be level and joint between base and floor will be of a uniform width.

6. Lines: Install tile to true, straight lines, with uniform joints, both vertically and horizontally.

7. Joints: Joints between floor tile and wall base or wall tile shall align exactly. Staggered joints between floor tile and tile on walls will not be accepted.

8. Spacing of Joints: Joint widths of wall tile shall be controlled by lugs on the sides of tile.

9. Finish surface of tilework shall be true to plane within 1/8" in any 8' length.

10. Set in place all floor drains, furnished under Division 15, in a watertight manner. Set drains in locations shown on the Drawings; align drain to tile joints. Where tile must be cut to accommodate drain, cut symmetrically around drain face.

3.5 INSTALLATION OF WALL TILE AND BASE:

A. Install wall tile in accordance with Method W202 and B415 in showers of the Tile Council of North America using thin-set mortar bond coat. Comply with the following general requirements:

1. Float dry-set mortar over substrate with pressure and over an area no greater than can be covered with tile while mortar remains plastic. Cover evenly with no bare spots. Thickness shall not be less than 3/32".

2. Apply mortar with notched trowel within 10 minutes before applying tile.

3. Do not apply tile to skinned-over mortar.

4. Provide a plumb and true mortar surface at the correct distance back from the finished wall line.

5. Do not soak tile.

6. Press tile firmly into freshly notched mortar. Tap and beat to a true surface.

7. Determine joint width by spacers on tile or by strings or pegs where tile is cut.

8. Press and beat tile into place to obtain at least 80% coverage by mortar on back of each tile. (100% coverage in showers)

9. Adjust tile before initial set of mortar takes place.

10. Shower wall tile to be installed on Glass Mesh Mortar Board similar and equal to "Wonder Board" by Modulars Inc.

B. Install wall tile in accordance with Method W242 of the Tile Council of North America using thin-set mortar bond coat. Comply with the following general requirements:

1. Float dry-set mortar over substrate with pressure and over an area no greater than can be covered with tile while mortar remains plastic. Cover evenly with no bare spots. Thickness shall not be less than 3/32".

2. Apply mortar with notched trowel within 10 minutes before applying tile.

3. Do not apply tile to skinned-over mortar.

4. Provide a plumb and true mortar surface at the correct distance back from the finished wall line.

5. Do not soak tile.

6. Press tile firmly into freshly notched mortar. Tap and beat to a true surface.

7. Determine joint width by spacers on tile or by strings or pegs where tile is cut.

8. Press and beat tile into place to obtain at least 80% coverage by mortar on back of each tile.

9. Adjust tile before initial set of mortar takes place.

3.6 INSTALLATION OF FLOOR TILE AND PAVERS:

A. Install floor tile in accordance with Method F121 of the Tile Council of North America including waterproofing membrane, wire mesh reinforced mortar bed and bond coat. Comply with the following general requirements:

1. Waterproofing membrane to be installed in accordance with requirements of the membrane manufacturer.

2. Install mortar setting bed to thickness shown on the Drawings, or 1 1/2” if thickness is not shown on Drawings, and to slope to floor drains. Locate wire mesh reinforcing at mid-depth of the setting bed.

3. Float mortar bond coat with pressure over area no greater than can be covered with tile while mortar remains plastic. Cover evenly with no bare spots. Thickness shall not be less than 3/32".

4. Comb mortar with notched trowel within 10 minutes before applying tile.

5. Do not apply tile to skinned-over mortar.

6. Press tile firmly into mortar. Align tiles immediately and beat to a true surface. Space joints between tiles to match across field of the tile.

7. Joints in wall, base and floor tile within a given space shall align exactly in all directions.

8. Press and beat tile into place to obtain at least 80% coverage by mortar on back of each tile.

9. Adjust tiles which are out of line or level.

B. Install floor tile in accordance with Method F122 of the Tile Council of North America. Comply with the following general requirements:

1. Float mortar bond coat with pressure over area no greater than can be covered with tile while mortar remains plastic. Cover evenly with no bare spots. Thickness shall not be less than 3/32".

2. Comb mortar with notched trowel within 10 minutes before applying tile.

3. Do not apply tile to skinned-over mortar.

4. Press tile firmly into mortar. Align tiles immediately and beat to a true surface. Space joints between tiles to match across field of the tile.

5. Joints in wall, base and floor tile within a given space shall align exactly in all directions.

6. Press and beat tile into place to obtain at least 80% coverage by mortar on back of each tile.

7. Adjust tiles which are out of line or level.

3.7 INSTALLATION OF TILE IN SHOWERS:

A. Install wall tile and floor tile in showers in accordance with Method B415 of the Tile Council of North America and ANSI A108.5. Wall tile to be installed on Glass Mesh Mortar Board similar and equal to "Wonder Board" by Modulars Inc. with thin-set mortar bond coat. Floor tile to be installed on 1" to 1 1/2" thick mortar bed reinforced with 2" x 2"

x 16/16-gauge wire mesh, on waterproofing membrane specified. Floor tile to be bonded to setting bed with thin-set mortar.

B. General instructions for installing tile included in Paragraphs 3.3 and 3.5 shall be applicable to installation of tile in showers except the tile in showers shall be pressed and beat in place so as to obtain 100% coverage by mortar on the back of each tile.

3.8 STONE THRESHOLDS: Install stone thresholds at locations indicated, set in same type of setting bed as abutting field tile, unless otherwise indicated.

3.9 EXPANSION JOINTS:

A. Provide, as work of this Section, expansion joints in accordance with requirements of TCNA EJ 171 unless specifically shown or specified otherwise. Furnish and install, as work of this Section, backer rod, sealant and other accessory materials. Materials and installation shall be in accordance with TCNA EJ 171 and Section 07 90 00 - Sealants.

3.10 GROUTING:

A. If strings were used to space the tile, remove before grouting but not until after the bond of the tile to the walls is complete.

B. Follow grout manufacturer's directions as to whether or not tile joints are to be soaked prior to applying grout.

C. Follow grout manufacturer's directions strictly and explicitly.

D. For cushion-edge tile, strike or tool joints to depth of cushion before grout sets. For square edge tile, fill joints flush with tile surface. Fill all gaps and skips.

E. Do not allow dark cement to show through grouted white joints.

3.11 CLEANING:

A. Sponge and wash tile thoroughly, diagonally across joints. Finally polish with clean, dry cloths.

B. The use of acid or acid cleaners to clean ceramic tile is strictly prohibited.

C. Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

3.12 CURING:

A. After installation, damp cure for at least 3 days.

END OF SECTION 09 30 00

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Gypsum wallboard work (Section 09 29 00).
2. Unit masonry work (Section 04 20 00).
3. Steel structure above ceiling (Sections of Division 5).
4. Mechanical items located in ceiling (Division 23).
5. Electrical items located in ceiling (Division 26).
6. Finish and color schedule (See Drawings).

B. Work Included This Section:

1. Exposed grid suspension system and acoustical lay-in panels.
2. All trim and supplementary components and materials required for a complete and finished installation.

1.3 INDUSTRY STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

The American Society for Testing and Materials (ASTM)
Underwriter's Laboratories Inc. (UL)

1.4 REQUIREMENTS OF REGULATING AGENCIES:

A. Underwriter's Laboratories Inc.: Acoustical ceiling material shall carry on the package the UL Fire Hazard Classification specified herein or shown on the Drawings.

1.5 SUBMITTALS:

A. Shop Drawings: Indicate the following:

1. Reflected ceiling layouts for all areas to receive acoustical ceilings.

2. Details of special area treatment, details of changes in level and all connections to work of other trades.

3. Submit typical layout showing size and spacing of grid members, access units and hangers as related to structural framing.

B. Samples: Submit samples of all acoustical units, suspension systems and accessories.

C. Manufacturer's Data: Submit manufacturer's printed technical literature and installation instructions for suspension system and acoustical units.

1.6 PRODUCT HANDLING:

A. Delivery: Deliver acoustical ceiling units to the Project Site in manufacturer's original packages with seals unbroken, with manufacturer's name and contents legibly marked thereon.

B. Storage: Store materials in enclosed areas with the same temperature and humidity conditions as the areas in which the material is to be installed.

1.7 ENVIRONMENTAL CONDITIONS:

A. Building Conditions: Install acoustical materials only when normal temperature and humidity conditions approximate the interior conditions that will exist when the building is occupied. The building shall not be cold and damp or hot and dry.

B. Glazing: Shall be in place and all exterior openings closed. All concrete, drywall and other wet work shall be completed and dry.

C. Heat and Ventilation: Shall be provided to maintain proper conditions before, during and after acoustical work is performed.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Subject to compliance with the Drawings and Specifications and approval by the Architect of the specified submittals, products by the following manufacturers will be acceptable for the Project.

1. Suspension System: Armstrong World Industries Inc., USG Interiors Inc., or Chicago Metallic Corp.

2. Acoustical Panels: Armstrong World Industries Inc., BPB (Celotex), or USG Interiors Inc.

B. Source: Products for use on this Project shall be of one manufacturer for each function unless noted specifically otherwise herein.

2.2 HANGERS:

A. Wire: No. 12 gauge galvanized steel wire.

B. Power Actuated Stud: As recommended by the grid system manufacturer.

2.3 SUSPENSION SYSTEMS:

A. Exposed Grid System:

1. For purposes of describing type and quality of product required, the Drawings and these Specifications are based upon Prelude XL Exposed Grid System for unrated ceilings and upon Prelude XL Fire Rated Exposed Grid system for fire-rated ceilings; Intermediate Structural Rating per ASTM C 635, as mfd. by Armstrong World Industries Inc. See Paragraph "Manufacturers" hereinbefore for other acceptable manufacturers.

2. Runner shall be double thickness web manufactured of steel conforming to ASTM A 1008. Main runner shall be 1 1/2" deep with 15/16" bottom flange. Cross runner shall also have 15/16" bottom flange and shall be of depth required to interlock with main runner and to comply with structural requirements specified herein.

3. All moldings shall be of not lighter than .019" thick steel.

4. System shall provide 2'-0" x 2'-0" exposed grid.

   a. Space main tee runners 48" o.c. as required by the manufacturer for the specified structural rating. Suspend from the structure above with wire hangers spaced not to exceed 4'-0" o.c.

   b. Space cross tees 24" o.c. at right angles to main tee runners for 24" square pattern.

5. Components: System shall consist of main support tees, cross tees, splice clips, wall angles, hold-down clips and all accessory items required.

6. Design Loads: Suspension system shall be designed to support respective lay-in units and mechanical and electrical fixtures, with deflection of suspension members not to exceed 1/360 of span of member.

7. Finish: Shall be factory baked enamel white paint.

8. Do not connect or suspend steel framing from ducts, pipes or conduit.

2.4 ACOUSTICAL PANELS:

A. For purposes of describing type and quality of ceilings required, the Drawings and Specifications are based upon products manufactured by Armstrong World Industries Inc. See Paragraph “Acceptable Manufacturers" for products by other manufacturers.

   1. Regular lay-in panels shall be Armstrong Cortega design, 24" x 24" (nominal), 5/8" thick, or approved equal, and shall incorporate the following properties.

      a. Rating: Acoustical material shall be mineral fiber and shall meet UL Fire Hazard Classification as follows: Flame spread - Class A, 25 or under.

      b. Weight: Units shall weigh a minimum of 0.63 lbs. per sq. ft.

      c. Properties: Units shall have the following properties: NRC shall be between 0.50 and 0.60; STC shall be between 35 and 39; light reflectance shall be LR-1 (85% or over).

      d. Edge Design: Units shall have square edges.

      e. Finish: Shall be the manufacturer's standard white paint finish.

   2. Tegular lay-in panels for Waiting 102, FR Kiosk 103 and Waiting 186 shall be Armstrong Ultima design, 24" x 24" (nominal), 3/4" thick, or approved equal, and shall incorporate the following properties.

      a. Rating: Acoustical material shall be mineral fiber and shall meet UL Fire Hazard Classification as follows: Flame spread - Class A, 25 or under.

      b. Weight: Units shall weigh a minimum of 1 lbs. per sq. ft.

      c. Properties: Units shall have the following properties: NRC shall be between 0.60 and 0.75; STC shall be between 35 and 40; light reflectance shall be LR-1 (90%).

      d. Edge Design: Units shall have tegular edges.

e. Finish: Shall be the manufacturer's standard white paint finish.

3. Panels for fire-rated ceilings shall be Armstrong Cortega Fire Guard Panels, 24" x 24" (nominal), 5/8" thick as mfd. by Armstrong Company, or approved equal, and shall incorporate the following properties.

a. Rating: Acoustical material shall be mineral fiber and shall meet UL Fire Hazard Classification as follows: Flame spread - Class A, 25 or under, and shall bear the UL Fire Resistive Label.

b. Weight: Units shall weigh a minimum of 1lb. per sq. ft.

c. Properties: Units shall have the following properties: NRC shall be between 0.50 and 0.60; STC shall be between 35 and 39; light reflectance shall be LR-1 (85% or over).

d. Edge Design: Units shall have square edges.

e. Finish: Shall be manufacturer's standard white paint finish.

PART 3: EXECUTION

3.1 INSTALLATION:

A. General Requirements for Installation:

1. Pattern, Layout and Types:

a. Install acoustical ceiling in pattern and types indicated on reflected ceiling plans and Room Finish and Color Schedule.

b. Treat each space surrounded by permanent-type partitions as a unit, without borders. Field shall be continuous without regard to movable partitions.

c. Unless indicated otherwise or on the Drawings, ceilings shall be laid out symmetrically in each space with equal width of panels at opposite walls.

2. Installation of acoustical panels and suspension systems shall be in strict accordance with manufacturer's written instructions.

3. Installation of acoustical panels and suspension systems shall be made by experienced mechanics and mechanics approved by the manufacturer of materials used.

4. Fit parts neatly and accurately, true to line and plane.

B. General Requirements for Suspension System:

1. Install suspension system in accordance with approved shop drawings, the manufacturer's written instructions, and in accordance with:

a. ASTM C 636, "Recommended Practice for Installation of Metal Ceiling Suspension System for Acoustical Tile and Lay-In Panels".

b. ASTME 580 - Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Seismic Restraint.

c. NC State Building Code, Arch. Component Design for Seismic Forces Requirements.

2. Install wall mold around area perimeter at proper level for finished ceiling height.

3. Hangers shall not be more than 3" out of plumb in length of hanger. If it is unavoidable for hangers to be out of plumb, they shall be out of plumb in off-setting directions such that the ceiling hangs true and without pushing to any side.

4. Where hangers fall at structural members, secure hanger wire to structural member. Where hangers fall between structural members, provide miscellaneous metal angles or channels between structural members to support hanger wires.

5. Suspension system, including wall mold, shall be level to within 1/8" in 12' with ceiling panels in place.

6. Exposed grid members shall be straight and in alignment. All exposed surfaces shall be flush and level.

7. Provide additional hangers to grid members at each corner of light fixtures.

a. See Electrical Drawings and Specifications for requirements for the Electrical Trade to clip the light fixtures to the ceiling grid or, if authorities having jurisdiction require, to hang the light fixtures from the structure above separately from the ceiling grid.

C. General Requirements for Acoustical Panels:

1. Scribe acoustical units neatly to abutting surfaces and to penetrations or protrusions.

2. Exercise care to prevent soiling of ceiling boards during installation. Leave entire system neatly and accurately fitted. The finish surface of the tile installed with concealed suspension system shall be flush and tightly fitted.

3. Chipped, discolored or damaged tile shall be removed at no additional cost to the Owner.

3.2 CLEANING: Following installation, clean all soiled and discolored surfaces. Remove and replace units which are damaged or improperly installed.

3.3 EXTRA STOCK: Furnish maintenance material matching products installed, packaged with protective covering for storage and identified with appropriate labels.

A. Acoustical Ceiling Units: Furnish 1 box of each type, size and color.

END OF SECTION 09 51 00

SECTION 09 54 50
CURVED METAL CEILING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes:
   1. Metal ceiling panels in Lobby 101.
   2. Exposed grid suspension system.
   3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

B. Related Sections:
   1. Section 09 51 00 – Acoustical Ceilings
   2. Section 09 29 00 – Gypsum Board
   3. Division 23 – HVAC
   4. Division 26 - Electrical Work

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
   2 ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
   3 ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   4 ASTM A 1008 “Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability”
   5 ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
   6 ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
   7 ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
   7. ASTM E 1264 Classification for Acoustical Ceiling Products.
   8. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer’s technical data for each type of acoustical ceiling unit and suspension system required.

B. Samples: Minimum 3-inch x 3-inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.

C. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items that are to be coordinated with or supported by the ceilings.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
   1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
      a. Flame Spread: 25 or less
      b. Smoke Developed: 50 or less

C. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle ceiling units carefully to avoid any distortion or damaged units in any way.

1.7 PROJECT CONDITIONS

A. Space Enclosure:

Building areas to receive ceilings shall be free of construction dust and debris.

1.8 WARRANTY

A. Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to:
   1. Panels: Sagging and warping
   2. Grid System: Rusting and manufacturer's defects

B. Warranty Period:
   1. Panels: Thirty (30) years from date of substantial completion.
   2. Grid: Thirty (30) years from date of substantial completion.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.9 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
   1. Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
   2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Metal Panels:
   1. Armstrong World Industries, Inc.
   2. US Gypsum

B. Suspension System:
   1. Armstrong World Industries, Inc.
   2. US Gypsum

2.2 WAVE PANELS

A. Panels Type: Serpentina perforated R125.:
   1. Composition: Aluminum panels
   2. Color: Custom Color
   3. Size: 48 inches wide; lengths 4 feet to 12 feet (in 2-foot increments)
   4. Provide 660H, 660V, 409H and 409V. See Drawings for layout.

2.3 SUSPENSION SYSTEM

A. Components: Main beams fabricated from painted commercial quality extruded aluminum; cross tee base metal and end detail are fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653.

   1. Color: Custom color and is to match the actual color of the selected ceiling tile.
   2. Semi-concealed Cross Tee
   3. Serpentina Waves Connector Sleeves: Slip over flange of main beams:
   4. Corner Post: Pre-assembled corner
   5. Cross Tee Connector Clip: Factory installed twist-in clip with pre-punched holes for attachment of cross tees to perimeter trim.
   6. Splice Plates used to align and secure joints between sections of Serpentina Perimeter Trim. One splice plate needed for each joint.
   7. Serpentina Perimeter Hold Down Clips as needed to maintain contact between panel and trim.
   8. Strong Back: Used for aid stability and squaring of the system during installation. Also eliminates hanger wires on perimeter cross tees. Hanger wires are still to be attached to the main runners, not the StrongBack.

C. Edge Moldings and Trim:
   1. Serpentina Perimeter Trim: Cut to size, curved for parallel attachment to main beams and straight for to close off ends.

D. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

E. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauges.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
   1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

A. Install suspension system and panels in accordance with manufacturer's instructions and in compliance with ASTM C 636 and with the authorities having jurisdiction.

B. Suspend main beam from overhead construction with hanger wires spaced 4-0 on center along the length of the main runner. Install hanger wires plumb and straight.

C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

D. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 54 50

SECTION 09 65 00
RESILIENT FLOORING

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Concrete floors (Section 03 30 00).
2. Gypsum drywall walls (Section 09 29 00).
3. Masonry walls (Section 04 20 00).
4. Luminous Egress Path Marking Systems (Section 10 14 43)

B. Work Included This Section:

1. Primer and adhesive.
2. Floor leveler.
3. Vinyl composition floor tile. (VCT)
4. Resilient wall base.
5. Vinyl treads.
6. Edge strips and all required accessories.

1.3 INDUSTRY STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

American National Standards Institute Inc. (ANSI)
The American Society for Testing and Materials (ASTM)
Federal Specifications (FS)

1.4 SUBMITTALS:

A. Shop Drawings: Submit manufacturer's technical literature and installation instructions for each type of flooring specified hereinafter.

B. Samples:

1. Submit the following samples of each type, color, and pattern of resilient flooring selected by the Architect, showing full range of color and pattern variations.

Full size tile samples.
6" long sample of wall base.
6" long sample of tread.

C. Prior to floor installation, provide letter from floor installer that a certified testing agency has tested the concrete slab for pH and vapor emissions. Letter shall state the vapor emissions and pH level are within the flooring manufacturer’s acceptable range to receive the finish floor. Include copies of test reports with the letter.

1.5 PRODUCT HANDLING:

A. Store resilient flooring materials as packaged by the manufacturer in an undamaged condition and with manufacturer's seals and labels intact. Care shall be taken to prevent damage and freezing during delivery, handling and storage. Store materials at the Project Site at least 24 hours prior to their installation. Stack tile boxes in accordance with manufacturer's written instructions.

1.6 ENVIRONMENTAL CONDITIONS:

A. Temperature: Materials and the area in which materials are to be installed shall be maintained at the following temperatures:

1. Store tile in rooms in which they are to be installed for 24 hours prior to laying tile at the specified temperature.

2. For at least 24 hours before installation of material and continuing for at least 48 hours after installation, maintain temperature at not less than 70° F. to not more than 90° F.

3. Maintain a minimum temperature of 55° F. after flooring is installed.

1.7 PROTECTION:

A. Close spaces to traffic in which resilient flooring is being set and to other work until flooring is firmly set. Where solvent-based adhesives are used, provide safety spark-proof fans and operate when natural ventilation is inadequate. Smoking shall be prohibited.

1.8 MAINTENANCE MANUALS: Provide 2 copies of maintenance manuals for resilient flooring describing maintenance procedures.

1.9 EXTRA STOCK:

A. Tile: Upon completion of the tile installation, furnish Owner with extra tiles of each type, color and pattern from the same lot as installed. Furnish 1 box of each type of resilient tile installed. Extra tile shall be in unopened original factory boxes.

B. Wall Base: Furnish 5% of quantity installed of each color selected.

C. Treads: Furnish 5% of quantity installed of each color selected.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS: Products of the following manufacturers equivalent to those specified herein will be acceptable for use on the Project when the specified submittals are approved (in writing) by the Architect:

A. Standard: For purposes of designating type and quality for the work under this Section, Drawings and Specifications are based on products by the manufacturers hereinafter specified.

1. Vinyl Composition Tile:

Armstrong World Industries Inc.
Azrock Industries, Inc.
Mannington Mills Inc.
Tarket

2. Vinyl Treads:

Armstrong World Industries
Flexco
Johnsonite

B. Source: Products for use on this Project shall be of one manufacturer for each function unless noted specifically otherwise.

2.2 PRIMER: Primer, where required for concrete subfloors, shall be as recommended by the adhesive and flooring manufacturer.

2.3 LEVELER: As recommended by the flooring manufacturer.

2.4 ADHESIVES:

A. Adhesive for cementing resilient flooring materials to subfloors shall be water-resistant type recommended by the flooring manufacturer.

B. Adhesive for wall base shall be as recommended by the base manufacturer.

2.5 RESILIENT FLOORING:

A. General Requirements for Resilient Flooring:

1. Resilient flooring of each color and pattern selected in any one area shall be from the same lot.

2. Colors will be selected from the manufacturers standard colors and patterns of the series specified.

3. Pattern shall extend through thickness of flooring and shall not be at surface only.

4. See Drawings Room Finish and Color Schedule for locations and flooring types.

B. Vinyl Composition Tile:

1. Vinyl composition tile shall comply with Federal Specification FS SS-T-312, Type IV, Composition 1 (asbestos free).

2. Tile shall be 12" x 12" x 1/8" thick. Provide 5 colors for pricing.

2.6 RESILIENT BASE:

A. Provide Flexco .125" thick, solid rubber base, 4" height, or equal approved in writing by the Architect.

B. Provide set-on cove type for remaining.

C. Provide corners from standard base sections as specified hereinafter in Part 3 of this Section.

D. See Drawings Room / Color Finish Schedule for type and location.

E. In addition to the resilient base shown on the Finish Schedule, provide resilient base around wood cabinetwork and elsewhere as shown on the Drawings.

2.7 VINYL TREADS:

A. Provide "Johnsonite Safe-T-Rib" (Visually Impaired) solid vinyl treads with contracting inserts by the Johnsonite Inc. or approved equal by other acceptable manufacturers listed hereinbefore.

1. Treads shall conform to Federal Specification RR-T-650C, Composition B, Type 2, shall have square nose design, 12 1/4" depth with 1 7/8" nose and thickness varying from 1/4" thick at the nose to 1/8" thick at back edge of tread and end of the nosing. Surface of the tread shall have ribbed texture. Color shall extend completely through the thickness of the tread.

B. Adhesive for installing treads shall either be furnished by the tread manufacturer or shall be a type recommended in writing by him for the subject installation.

2.8 EDGE STRIP: Vinyl, thickness to match resilient flooring, not less than 1" wide, with beveled edge, color as selected by Architect, and furnished by the flooring manufacturer.

2.9 ACCESSORIES: Furnished by or type recommended by the resilient flooring manufacturer.

2.10 ASBESTOS: All flooring, wall base, adhesive, leveler and primer products, and other materials used shall be asbestos free.

PART 3: EXECUTION

3.1 CONDITION OF SURFACES:

A. Manufacturer's Requirements: Surfaces to receive resilient flooring shall meet the minimum requirements established by the manufacturer of the flooring and adhesive. Work shall not be started until defects have been corrected.

B. Tolerances: Subfloor surface shall not vary more than $\pm$ 1/8" in any 10' dimension. Neither shall they vary at a rate greater than 1/16" per running foot. No abrupt deviations from a smooth surface will be permitted. Defective areas shall be corrected by the trades involved.

3.2 PREPARATION OF SURFACES:

A. Remove debris, dirt, grease and all other foreign matter from surfaces to receive flooring and base.

B. Inspect surfaces for holes, cracks and smoothness. Do not proceed with flooring installation until surfaces are level and smooth with holes and cracks filled with an approved filler. Depressions shall be filled, and high spots ground down to the specified tolerance.

3.3 APPLICATION OF PRIMER: Apply primer to cover substrate completely. Apply at rate recommended by manufacturer of resilient flooring.

3.4 INSTALLATION OF LEVELER: Install in accordance with printed instructions of the manufacturer of the floor leveler. Top surface of finished underlayment shall be level and smooth within the tolerances specified.

3.5 APPLICATION OF ADHESIVE:

A. Bond and Moisture Test: Perform bond and moisture test per manufacturer’s written recommendations.

B. Mix and apply adhesive in accordance with the adhesive manufacturer's directions. Cover surface evenly with adhesive. Area covered by one application of adhesive shall not exceed the maximum working area recommended by the manufacturer. Install resilient flooring within the time limits recommended by the manufacturer. If adhesive films over or dries, it shall be removed, and the area shall be cleaned and recoated.

3.6 INSTALLATION OF RESILIENT FLOORING:

A. Lay resilient flooring true, level and with tight, flush aligned joints. Joint treatment shall be in accordance with published instructions of the flooring manufacturer. Roll flooring in accordance with the manufacturer's installation instructions to assure intimate contact and proper adhesion. Accurately cut resilient flooring to and around permanent cabinets and fixtures to provide a close fit; seal joint with sealant recommended by the flooring manufacturer.

B. Unless shown otherwise on the Drawings, align joints with room axis. Center tile work between walls.

C. Lay tile so that cut tile at walls will be minimum of 1/2 tile. Where it is necessary to lay tile less than 1/2 tile, minimum shall be 3".

D. Floor tile shall be laid with random pattern.

E. Lay out special patterns in accordance with approved shop drawings.

F. Install edge strip where resilient flooring terminates at exposed concrete.

G. Where shown on finish schedule, lay tile on concrete filled metal stairs tight and flush with edge of safety nosing and scribe tight to sides of stringer and face of riser.

3.7 INSTALLATION OF RESILIENT BASE:

A. Install base level, true and tight against supporting surface. No joints in base shall occur within 12" of a corner.

B. Corners shall be made by scoring, mitering and heating standard base sections prior to bending around corner and adhering.

C. Cement base firmly to wall. Joints shall be tight. Base (throughout its entire length) shall have top and bottom edges in firm contact with walls and finish floors. Scribe base accurately to trim.

3.8 INSTALLATION OF VINYL TREADS:

A. Tread covers are to be full width and depth of the structural treads.

B. Install in accordance with the manufacturer's written instructions.

3.9 CLEANING AND WAXING:

A. Immediately upon completion of resilient flooring in a room or area, dry-clean floors and adjacent surfaces with a cleaner approved by manufacturer of resilient flooring. Remove surplus adhesive and other soiling.

B. Floors shall not be washed for at least 5 days after installation. Wash floors with non-alkaline cleaning solution approved by manufacturer of resilient flooring. Rinse thoroughly with clean, cold water.

C. Wax flooring with 2 coats of water-emulsion wax as recommended by manufacturer of resilient flooring. Buff floor after each coat of wax to an even lustre. Buff floors with an electric polishing machine.

D. Do not wax base; clean and rub to high gloss.

3.10 PROTECTION: Allow no traffic on finished floors unless they are protected with heavy paper.

END OF SECTION 09 65 00

SECTION 09 68 10
CARPET TILE

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Concrete floor slabs (Section 03 30 00).

2. Resilient wall base (Section 09 65 00).

3. Room Finish and Color Schedule (See Drawings).

4. Electrical outlets and cover plates located in floor (Division 26).

B. Work Included This Section:

1. Carpet tiles adhered to substrate.

2. All carpet accessories required for a complete and proper installation.

1.3 SUBMITTALS:

A. Shop Drawings:

1. Shop drawings shall show plan of areas to receive carpet tile and locations and details of edging.

2. Submit manufacturer's technical data including all properties specified for carpet and detailed installation instructions.

B. Samples: Samples of each carpet tile selected shall be submitted for Architect's approval. Carpet samples shall be full size 24" x 24" tiles. Accessories shall be minimum 6” long.

C. Test Reports: Submit (in duplicate) report of test by an independent laboratory of Fire Tests specified hereinafter.

D. Guarantee-Warranty:

1. Contractor shall furnish a written guarantee against defects in materials or workmanship, subject to correction at no cost to the Owner, provided the Contractor is notified in writing of all defects within a period of 2 years from the date of Project Acceptance.

2. Submit manufacturer's limited lifetime wear & backing warranty.

E. Manufacturer's Data:

1. Test Reports: Submit (in duplicate) reports of tests performed by independent testing laboratory in accordance with requirements of this Section.

2. Installation Instructions: Submit (in duplicate) manufacturer's printed installation instructions for carpet and adhesive.

F. Prior to floor installation, provide letter from floor installer that a certified testing agency has tested the concrete slab for pH and vapor emissions. Letter shall state the vapor emissions and pH level are within the flooring manufacturer's acceptable range to receive the finish floor. Include copies of test reports with the letter.

1.4 DELIVERY AND STORAGE: Deliver materials to the Project Site in manufacturer's original, unopened packaging clearly marked as to the contents, size and dye lot. Store materials in a secure, safe area and protect against damage, deterioration and contamination.

1.5 EXTRA STOCK: Deliver to Project, 5% overrun based on installed yardage of each type of carpet. Provide required overrun exclusive of carpet needed for proper installation and waste.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS: Products that meet these Specifications and manufactured by the following companies will be acceptable for use on the Project when submittals specified hereinafter are approved (in writing) by the Architect.

Mannington Commercial
Bentley Mills
Masland Contract
Atlas Carpet Mills

A. Standard: For purposes of designating type and quality for the work under this Section, Drawings and Specifications are based on products manufactured or furnished by the manufacturers specified for the product.

B. Source: Products for use on this Project shall be of one manufacturer unless noted specifically otherwise herein.

C. Applicator: Submit letter from carpet manufacturer stating that carpet installer is approved by the manufacturer for application of the type and size project specified. Letter shall certify that installer has satisfactorily applied the type of installation specified. Letter shall be on manufacturer's letterhead and shall be signed by an officer of the company.

2.2 GENERAL REQUIREMENTS FOR CARPET:

A. Fire Tests:

1. Carpet shall pass Methenamine Pill Test as performed in accordance with ASTM D 2859 (self-extinguishing).

2. Flammability: When tested in accordance with ASTM E 648, carpet shall have a critical radiant flux rating not lower than 0.45 watts per sq. cm. (Class I)

B. Static Resistance:

1. Each type of carpet shall have a static resistance rating of not more than 1.5 KV when tested at 20% R.H. and 70° F. by Test Method AATCC 134.

2.3 CARPET:

A. For purposes of describing type and quality of products required, the Drawings and Specifications are based upon carpet by Bentley Mills. See Paragraph 2.3 hereinbefore for other acceptable manufacturers.

B. The following type of carpet is required. See Drawings for Room - Finish and Color Schedule for other information including locations and colors.

1. Bentley Mills Malibu Colony Collection, or approved equal:

Construction:	Tufted Tip Sheared
Face Yarn:	Antron Legacy Type 6.6 nylon
Dye Method:	Piece Dye
Yarn Weight:	26 oz./yd.
Gauge:	1/12
Stitches per inch:	11.5/in.
Backing:	NexStep Cushion Tile
Pile Thickness:	.365-.375 in.

2.4 LEVELER: latex-modified, hydraulic cement-based formulation provided by or recommended by carpet manufacturer.

2.5 FLOOR SEALER: Floors to receive carpet shall be sealed with Kure-N-Seal by Sonneborn, 8414 Sealer by Intex Products Inc., Masterseal by Master Builders, or as recommended by carpet manufacturer.

2.6 ADHESIVE: Water-resistant, mildew resistant, non-staining type to suit products and subfloor condition, complies with flammability requirements for installed carpet and is recommended by carpet manufacturer

2.7 ACCESSORIES: Provide edge strips fabricated from extruded rubber in color approved by the Architect. Also provide any other accessory materials required for a complete and finished installation.

PART 3: EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.

B. Concrete subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet manufacturer.

2. Subfloor finishes comply with requirements specified in Section 03 30 00.

3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

3.2 PREPARATION:

A. Comply with CRI 104, Section 6.2, “Site Conditions, Floor Preparations” and carpet manufacturer’s written installation instructions for preparing substrate.

B. Use leveling and patching compounds according to manufacturer’s written instructions to fill cracks, holes, and depressions in substrate.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use methods recommended in writing by carpet manufacturer.

3.3 MEASUREMENT: The sizes and proper clearances for carpet shall be determined before application. Coordinate with the work of other trades to avoid conflicts. Clearance requirements of doors that swing over carpeted areas are specified under other Sections of these Specifications or are shown on the Drawings.

3.4 MODULAR CARPET INSTALLATION:

A. Comply with requirements for broadloom carpet installation with the following exceptions:

1. Comply with CRI 104, Section 13, “Carpet Modules (Tiles).”

2. Installation method: As recommended in writing by the carpet tile manufacturer.

3.5 ELECTRICAL OUTLETS: It will be the carpet installer's responsibility to coordinate his work with the installation of electrical outlets and cover plates located in the floor. If the electrical contractor has already installed the cover plates, the carpet installer shall remove the cover plates and then after installation of the carpet, replace the cover plates. If the cover plates are not installed at the time of carpet installation, the electrical contractor shall install the cover plates after the carpet is installed.

3.6 CLEANING: Spots and smears of floor covering adhesive and seam cement shall be removed immediately with solvent as recommended by the carpet manufacturer. Area shall be vacuumed clean and carpet protected from soiling and damage as recommended by the manufacturer during remainder of the work.

END OF SECTION 09 68 10

SECTION 09 91 00
FIELD PAINTING

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Shop priming and factory finishing of certain materials and equipment are specified in other sections of the Specifications.

2. Special coatings such as epoxy coatings, elastomeric coatings and other special high-performance coatings may be specified in other Sections of this Division of the Specifications.

B. Work Included This Section:

1. All field painting on the entire Project, including new and existing materials and equipment specified in other Sections and plumbing, mechanical and electrical materials and equipment specified in Divisions 22, 23 and 26, is specified as work of this Section 09 91 00, with the following exception:

a. Painting of plumbing, mechanical and electrical materials and equipment located inside Equipment Rooms is specified in Divisions 22, 23 and 26 to be provided by the plumbing, mechanical and electrical trades.

2. Paint all surfaces exposed to view in the completed work, both exterior and interior, unless specifically enumerated not to be painted.

3. Work includes field painting of exposed bare and covered pipes, conduit and ducts (including color coding), and of hangers, exposed steel conduit and iron work, miscellaneous metal items and primed metal surfaces of materials and equipment installed under plumbing, mechanical and electrical work.

4. Work includes stenciling "Fire And Smoke Barrier - Protect All Openings" , or similar wording as required by authorities having jurisdiction, signs above ceilings on both sides of all fire rated walls.

5. Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces whether or not designated in finish schedules. Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect will select these from standard colors or finishes available.

6. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

7. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.

C. Surfaces Not to Be Painted:

1. Unless otherwise indicated, painting is not required for surfaces for which the natural finish of the material is obviously the final finish, such as (for example only) glass, precast concrete, face brick, plastic laminate, stonework, ceramic tile and other such items that traditionally and obviously are not painted.

2. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as (for example only) metal toilet enclosures, pre-finished partition systems, acoustic materials, elevator entrance doors and frames, elevator equipment, and pre-finished mechanical and electrical equipment, including light fixtures, switchgear and distribution cabinets.

3. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as (for example only) walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.

4. Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of (for example only) anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting. Note that galvanized steel does not fall into this category and is required to be painted.

5. Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting.

6. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates. An exception to this is that embossed or etched fire rating labels on hollow metal frames may be painted over provided that they are cleaned and properly prepared so that paint will adhere tightly to the label.

7. Finish Schedule: Painting is not required for walls, floors and ceilings that are specifically scheduled not to be painted in the Finish Schedule.

1.3 QUALITY CONTROL:

A. Color Samples: Submit samples of colors selected by the Architect in duplicate for final approval. Samples shall be approximately 8" x 10" size and on wood when finish is to be on wood; on gypsum wallboard when finish is to be on gypsum wallboard, masonry, concrete, or plaster; and on sheet steel when finish is to be on metal. Sample shall be finished as specified in "Schedule of Paint Systems."

B. Shop Drawings: Submit manufacturer's literature completely describing each type of paint, including each product in the stain and varnish system, and including manufacturer's published installation instructions for each product. See Paragraph "Materials" for other submittal requirements.

1.4 INDUSTRY STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

The American Society for Testing and Materials (ASTM)

1.5 PRODUCT HANDLING:

A. Delivery and Storage:

1. All materials shall be delivered to the site in the manufacturer's sealed packages with labels intact and seals unbroken.

2. A space will be designated for the storage of paint materials and tools. Whenever it may be necessary to change the location of this storage space, promptly move to the newly designated place. Protect the storage space floor from damage.

3. Cover all paints at all times. Take all safeguards to prevent fire.

PART 2: PRODUCTS

2.1 MATERIALS:

A. Painting Materials:

1. In order to describe type and quality of materials intended, painting materials specified are products of Sherwin Williams. Paint products of Benjamin Moore, Duron, ICI, Martin-Senour, MAB, PPG, Pratt and Lambert, or others may be used when the following is approved in writing by the Architect.

a. Submit to the Architect a schedule of painting based on the format hereinafter used to specify paint systems for the various surfaces, stating the brand name, trade name and manufacturer's number of each of the materials proposed.

b. Include manufacturer's data sheet for each type of paint proposed.

c. Include complete installation instructions for each paint product including for stain and varnish work wood filler, solvent wash, stain, sanding sealer, varnish and all other products of the stain and varnish system.

d. Receive from the Architect written approval of these submittals before beginning work.

e. All paints to be low or no VOC's, water-based and solvent and mercury free.

2. Tinting of colorants shall be as recommended by manufacturer of finishing materials and shall be those supplied by the finish manufacturer. All colors shall be non-fading under exposure to which they will be normally subjected.

3. Additives to Finishing Materials: Add only those ingredients required or recommended by the manufacturer of the finishing material. Source of such additives shall be as recommended by the manufacturer of finishing material.

4. Thinner: Shall be type and product recommended by manufacturer of finishing material.

a. Turpentine: Pure gum spirits of turpentine, conforming to ASTM D 13.

5. Oils:

a. Raw Linseed: Conforming to ASTM D 234.

b. Boiled Linseed: Conforming to ASTM D 260.

6. Shellac: Pure Whitegum cut in pure denatured alcohol.

7. Wood Fillers: Select paste type fillers tinted to match color of the stain to be used.

8. Stains: Preferably as manufactured or furnished by manufacturer of the paint materials. Stains shall be compatible with surface receiving it and with other finishing materials being applied.

B. Putty: For surfaces to receive transparent finish, putty shall be colored to match final color of the finished wood as represented by submitted sample approved by the Architect and Owner.

C. Metal Cleaners: As recommended by the paint manufacturer.

2.2 FIRE AND SMOKE BARRIER SIGNS:

A. Fire rated walls shall be effectively and permanently identified with stenciled signs provided in accordance with the 2002 International Building Code with North Carolina Amendments and other authorities having jurisdiction. Such signs shall be located above any decorative ceiling and in concealed spaces, on both sides of the wall and shall read "Fire And Smoke Barrier - Protect All Openings". or similar wording as required by authorities having jurisdiction. Color shall be white background with red letters.

B. Stenciled letters shall be 2" high and signs shall be located 20'-0" on centers maximum.

2.3 SCHEDULE OF PAINT SYSTEMS:

A. Except as required otherwise in the Contract Documents for specific areas or surfaces, the following materials, or approved equal, shall be used on the surfaces scheduled:

B. Review the entire Drawings and Specifications including Divisions 15 and 16 Mechanical and Electrical Specifications for description of materials and equipment therein to be painted under this Section. See Paragraph "1.2 Scope" for additional information and requirements regarding work included in this Section.

1. EXTERIOR PAINT SYSTEMS:

Provide the following paint systems for various substrates, as indicated:

a. EXTERIOR FERROUS METAL:

SYSTEM	Latex Gloss
PRIMER	1 coat All Surface Enamel latex Primer A41W210 @ 2.5 mils DFT/ct.
FINISH	2 coats A100 Exterior Latex Gloss House Paint @1.3 mils DFT/ct.

b. EXTERIOR ALUMINUM:

SYSTEM	Gloss
FINISH	2 coats DTM Gloss (B66-100) @2.5 - 4.0 mils DFT/ct

c. EXTERIOR GALVANIZED METAL:

SYSTEM	Latex Gloss
PREP	SW Prepaint Cleaner (no rinse)

PRIMER	1 coat All Surface Enamel Latex @2.5 mils DFT/ct
FINISH	2 coats A100 Latex Gloss House Paint @1.3 mils DFT/ct

d. EXTERIOR CONCRETE:

SYSTEM	Latex Satin
PRIMER	1 coat Loxon Block Surfacer @ 8 mils DFT/ct
FINISH	2 coats A100 Exterior Latex Satin House Paint @ 1.3 mils DFT/ct

2. INTERIOR PAINT SYSTEMS: Provide the following paint systems for various substrates, as indicated:

a. INTERIOR FERROUS METAL:

SYSTEM	Latex Semi Gloss
PRIMER	All Surface Latex Enamel Primer @ 2.5 mils DFT/ct
FINISH	2 coats Pro Mar 200 Latex Semi-Gloss @1.3 mils DFT/ct.

b. INTERIOR GALVANIZED METAL:

SYSTEM	Latex Semi Gloss
PRIMER	All Surface Latex Enamel Primer @ 2.5 mils DFT/ct
FINISH	2 coats Pro Mar 200 Latex Semi-Gloss @1.3 mils DFT/ct.

c. INTERIOR ALUMINUM:

SYSTEM	Alkyd Base, Semi Gloss
PRIMER	1 coat Galvite HS Primer @ 3.0 mils DFT/ct
FINISH	2 coats Pro Mar 200 Interior Alkyd Semi-Gloss @1.7 mils DFT/ct

d. INTERIOR EXPOSED CEILINGS (including metal deck, bar joists, concrete floor struct., air ducts, etc.):

SYSTEM	Flat Dry Fall
SURFACE PREP	Surfaces must be firm, dry and clean, free of dirt, grease and other surface contaminants. Scrub or high-pressure detergent wash as required. Allow to thoroughly dry.
PRIMER	1 coat Kem Bond #5 Primer @ 2.0 – 5.0 mils DFT/ct
FINISH	1 or 2 coats Super Savelite Flat Dry Fall B-48 series @ 2.0 – 3.0 mils DFT/ct

e. INTERIOR CMU (except where epoxy indicated):

SYSTEM	Latex, Semi Gloss
PRIMER	1 coat Block Filler – B25W25 (finvoids) @ 8 mils DFT/ct
FINISH	2 coats Pro-Mar Latex Semi-Gloss @1.3 mils DFT/ct

f. INTERIOR CONCRETE:

SYSTEM	Latex Semi Gloss
PRIMER	1 coat Block Filler B25W25 @ 8 mils DFT/ct
FINISH	2 coats Pro Mar Latex Semi-Gloss @ 1.3 mils DFT/ct

g. INTERIOR GYPSUM WALLBOARD: (Eggshell)

SYSTEM	Latex, Eggshell
PRIMER	1 coat Preprite Classic Primer @1.6 mils DFT/ct
FINISH	2 coats Pro Mar Latex Eg-shel @1.6 mils DFT/ct

h. INTERIOR GYPSUM WALLBOARD (Flat at ceilings)

SYSTEM	Latex Flat
PRIMER	1 coat Preprite Classic Primer @ 1.6 mils DFT/ct
FINISH	2 coats Pro-Mar 200 Latex Flat @ 1.4 mils DFT/ct

i. INTERIOR GYPSUM WALLBOARD (Epoxy at toilets)

SYSTEM	Water Based Epoxy
PRIMER	1 coat Water Based Catalyzed Epoxy Primer @ 2.5 mils DFT/ct
FINISH	2 coats Water Based Catalyzed Epoxy @ 2.5 mils DFT/ct

j. INTERIOR WOOD - PAINTED:

SYSTEM	Latex Semi Gloss
PRIMER	1 coat Wall & Wood Primer @ 1.9 mils DFT/ct
FINISH	2 coats Pro Mar Latex Semi-Gloss @1.3 mils DFT/ct

k. INTERIOR WOOD - STAIN AND VARNISH:

SYSTEM	Oil Base Stain
PRIMER	1 coat Wood Classics Oil Stain (optional) 1 coat Classics Sanding Sealer (optional)
FINISH	2 coats Classic Oil Base Varnish @1.3 mils DFT/ct

l. PIPE AND EQUIPMENT INSULATED COVERING:

SYSTEM	Enamel, Semi Gloss
PRIMER	1 coat All Surface Enamel Primer A41W210 @2.0 mils DFT/ct
FINISH	2 coats Pro Mar 400 Latex Semi-Gloss @1.3 mils DFT/ct

m. PLASTIC SURFACES:

SYSTEM	Latex, Semi Gloss
PREPARATION	Scuff-sand all plastic surfaces prior to application of primer
PRIMER	1 coat Preprite Bonding Primer (test for adhesion)
FINISH	2 coats Pro Mar Latex Semi-Gloss @ 1.3 mils DFT/ct

n. INTERIOR CONCRETE FLOORS:

SYSTEM	Acrylic
FINISH	2 coats Kure-N-Seal W Concrete Sealer by Sonneborn.

PART 3: EXECUTION

3.1 COLORS:

A. Before any work is done, the Architect will furnish the Contractor with a color schedule showing where the various colors shall go. The Contractor shall then submit samples and prepare samples at the job as specified on each substrate.

3.2 GENERAL REQUIREMENTS:

A. A pre-installation meeting is required for all painting. Meeting shall be attended by Owner, Architect, Contractor, and other representatives directly concerned with performance of the work. The Contractor will conduct the meeting.

B. All painting procedures, including surface preparation and application of materials shall be in strict accordance with the manufacturer's published instructions and recommendations.

C. The commencing of work, or the absence of notification in writing to the contrary, shall be construed as acceptance of the surfaces to be finished as satisfactory to receive the finishes and to produce the results required.

D. All spaces shall be broom clean before painting is started.

E. Surfaces to be finished shall be clean, dry, smooth and adequately protected from dampness.

F. Provide ample protection for, and take particular care to protect adjoining surfaces, fixtures and materials of all kinds. Repair any damage caused by the work of this Section. If necessary to accomplish this, remove and protect hardware, accessories, device plates, lighting fixtures, factory finished work and similar items. Upon completion of each space, carefully replace all removed items. Use only skilled mechanics for removal, replacement and protection.

G. Remove doors to finish top and bottom after doors have been fitted.

H. Remove electrical panel box cover and door before painting wall. Paint separately and reinstall after all paint is dry.

I. No work shall be done under conditions which are unsuitable for the production of good results. Do not apply paint when temperature is below 50° F. Do not apply exterior paint in damp, rainy weather. Do not apply finishes on surfaces so hot as to prevent proper application and drying. Do not apply finishes in spaces where dust is being generated that would speck the finish.

J. Before painting CMU or concrete, test surfaces with a moisture testing device. No paint or sealer shall be applied on plaster or concrete when moisture is tested to be over 5.5%.

3.3 PREPARATION OF SURFACES:

A. Existing Surfaces: All existing surfaces shall be prepped, as necessary, to receive the 3-coat paint system specified, including, but not limited to, removal of existing paint systems, patching, and sanding.

B. CMU: Properly clean and prep to produce and satisfactory surface for painting.

C. Gypsum Drywall: Follow the USG Handbook (latest edition) for cleaning and prepping surface.

D. Plaster:

1. Fill holes and cracks. Seal before painting.

2. Do not use sandpaper on plaster surfaces.

E. Wood: Sandpaper to smooth and even surface and then dust off. Knots, sap and pitch streaks in lumber to be painted shall be given a brush coat of thin shellac before priming coat is applied. Thoroughly fill nail and other holes and cracks with putty; for natural or transparent stain finish, color putty to match final color of the stained wood. Putty shall be applied as many times as is necessary in order to ensure that after curing the putty surface will be flush with the wood surface (neither concave below nor convex above the surface of the wood).

F. Steel and Iron:

1. Remove grease, rust, scale and dust. Except as noted otherwise, sandpaper as required to produce a satisfactory surface for painting.

G. Galvanized Metal: Thoroughly clean with metal cleaner according to cleaner manufacturer's directions; rinse and wipe dry. Galvanized steel manufacturer and paint manufacturer must approve the use of the cleaner prior to use.

3.4 PRIMING:

A. See the other Sections of these Specifications for shop priming requirements specifically related to materials and items therein specified.

B. The shop coat is not to be considered this Contractor's prime coat. Apply primer as specified.

C. All coats required in the schedule of painting shall be applied, including all scheduled prime coats and finish coats. Surfaces of factory primed items shall be sanded if necessary and otherwise properly prepared and all scheduled prime coats and finish coats shall be applied.

3.5 APPLICATION:

A. All paint materials shall be stirred or agitated thoroughly until the ingredients are completely mixed.

B. Surface to be stained or painted shall be adequately protected from dampness.

C. Each coat of paint shall be well applied, worked out evenly and allowed to dry (at least 24 hours) before subsequent coat is applied.

D. Sand between coats to produce an even, smooth finish.

E. Suction or hot spots in plaster or concrete which are noticeable through the first coat shall be touched up before applying the second coat to produce an even result in the finish coat.

F. Where only one coat of the finish material is required by the schedule of painting, the undercoat shall be tinted to match the finish coat.

G. Finished work shall be uniform, of approved color, and free from runs, sags, defective brushing, clogging or excessive flooding. Make edges of paint adjoining other materials or colors sharp, straight, clean and without overlapping.

H. Use fillers, sealers, primers and other materials as recommended by the stain manufacturer such that the applied stain work will result in a uniform color and will match samples and mock-up work approved by the Architect and Owner.

I. At completion, touch up and restore finish where damaged and leave in good condition.

J. Should any coat of paint be adjudged unsatisfactory by the Architect, it shall be sandpapered or removed, and additional coats applied as necessary until satisfactory finish is achieved.

3.6 CLEANING:

A. All cloths and cotton waste that might constitute a fire hazard shall be placed in metal containers or destroyed at end of each working day.

B. At the completion of this work, all staging, scaffolding, containers, debris, etc., shall be removed from the premises.

C. Painted surfaces shall be left in a clean condition. Remove paint spots, oil or stains from adjacent surfaces.

D. Unstick all doors and repair any damaged areas of paint.

END OF SECTION 09 91 00

SECTION 10 11 00
VISUAL DISPLAY BOARDS

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Work Included This Section:

1. Furnish and install porcelain enamel markerboards and tackboards as shown and specified including all supplementary materials and installation accessories required for a complete and proper installation.

1.3 SUBSTITUTIONS:

A. When requesting approval of a substitute product, submit samples and all pertinent technical data to the Architect not less than ten (10) days prior to receipt of bids.

B. Approval of substitute products will be included in an addendum issued by the Architect prior to receipt of bids, to ensure that all bidders are notified and aware of such approval.

1.4 PRODUCT HANDLING:

A. Markerboards, tackboards and tackstrips shall be delivered to the Site in unopened containers, labeled plainly with the manufacturer's name and installation mark.

B. Markerboards, tackboards and tackstrips shall be stored in safe, dry locations and shall not be unpacked until needed for installation. Handling and installation of materials shall be in a manner that will protect them from damage.

1.5 SUBMITTALS:

A. Shop Drawings: Submit for each type of markerboard, tackboard and tackstrip. Include sections of typical trim members and dimensioned elevations showing mounting heights, anchors, reinforcements, accessories and installation details.

B. Product Data: Submit manufacturer's technical data and installation instructions for each material and component part, including data verifying that materials comply with requirements.

C. Samples: Provide cross-section sample of chalkboard, markerboard, tackboard and tackstrip. Provide full range of manufacturer’s standard colors and materials as specified for selection by Architect.

D. Submit manufacturer’s recommended maintenance instructions.

1.6 WARRANTY:

A. Furnish the manufacturer’s written warranty agreeing to replace markerboards that do not retain their original writing and erasing qualities or exhibit cracking, flaking, or assembly failures, provided the manufacturer’s instructions with regard to handling, installation, protection, and maintenance have been followed. Warranty period shall be for the lifetime of the building.

PART 2: PRODUCTS

2.1 GENERAL:

A. Extruded aluminum frame and trim shall have clear anodized finish.

B. See Drawings for locations and sizes of boards.

2.2 ACCEPTABLE MANUFACTURERS: Subject to compliance with the Drawings and Specifications, products by the following manufacturers will be acceptable for work of this Section.

AARCO
Claridge Products and Equipment, Inc.
Platinum Visual Systems
Newline

2.3 MATERIALS:

A. Markerboard:

1. Writing surface shall be High Gloss Porcelain Marker Surface. 24-gauge steel and manufactured in accordance with PEI Performance Specifications for porcelain enamel steel markerboards, or equivalent approved in writing by the Architect. Architect will select colors from the manufacture's standard colors.

2. Provide .005" minimum thickness aluminum backing sheet.

3. Face Sheet: Ceramicsteel panel surface, properly pre-cleaned and treated. The ceramic finish shall be fused to the steel sheet at a temperature not exceeding 1400 degrees F.

4. Core: Provide ½ inch particleboard core material complying with the requirements of ANSI A208.1, Grade 1-M-1.

5. Laminating Adhesive: Provide the manufacture's standard moisture-resistant thermoplastic type adhesive.

6. Quantity: Provide total of eight (8) 4'x 8' Markerboards – locate as directed by the Owner.

B. Aluminum Frames and Trim: Fabricate frames and trim of not less than 0.062" thick aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single length units wherever possible. Keep joints to a minimum. Miter corners to a neat, hairline closure.

1. All markerboards shall have full length, fixed chalk trough with aluminum end closures. Provide a continuous Map Rail with cork insert and end closures. All Map Rails to have two 1" Map Hook/Clip combination per 4' wide section.

PART 3: EXECUTION

3.1 PREPARATION:

A. Take field measurements prior to the release of fabrication of material where possible. Allow for trimming and fitting wherever taking of field measurements before fabrication might delay work.

B. Assembly: Provide factory-assembled board sections, except where field-assembled units are required. Make joints only where total length exceeds maximum manufactured length. Fabricate with a minimum number of joints, balanced at the center of the board, as acceptable to the Architect.

C. Provide splined joints without cover trim between abutting sections of boards. Provide manufacturer's standard mullion trim at joints between chalkboard and tackboard in combination.

3.2 INSTALLATION:

A. Coordinate installation of markerboards with other related trades.

B. Install units in locations and at the mounting heights indicated and in accordance with the manufacturer's instructions. Keep perimeter lines straight, plumb, and level. Provide clips, adhesive, brackets, anchors, trim, and accessories necessary for a complete installation.

C. Verify mounting heights of boards with Architect prior to installation.

3.3 ADJUST AND CLEAN:

A. Verify that accessories required for each unit have been properly installed.

B. Clean units in accordance with the manufacturer's instructions.

C. Protect installed units against damage until completion of Project.

D. All surfaces shall be clean and free from scratches or blemishes. Break-in visual display boards only as recommended by the manufacturer.

END OF SECTION 10 11 00

SECTION 10 14 00
SIGNAGE

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Hollow metal doors and frames (Section 08 11 00).
2. Wood doors (Section 08 21 00).
3. GWB Walls (Section 09 29 00).
4. CMU walls (Section 04 20 00).

B. Work Included in This Section:

1. Interior and exterior signage as shown and specified including all supplementary materials and installation accessories required for a complete and proper installation.

2. Signage schedule follows this Section.

1.3 SUBMITTALS:

A. Shop Drawings:

1. Show location, arrangement, dimensions, materials, finishes, connections, anchorage and relation to adjacent work.

B. Manufacturer's Data:

1. Submit (in duplicate) manufacturer's printed specifications and installation instructions for work of this Section.

C. Samples:

1. Submit sample of the specified type of sign.

D. Schedule of Individual Signs:

1. Prior to fabrication of any signage, submit to the Architect a schedule of signs, both interior and exterior, showing details of each sign and copy to be included on each sign. Do not begin fabrication of any signage prior to written approval by the Architect of this Schedule.

1.4 AMERICANS WITH DISABILITIES ACT:

A. All signage on the project that falls under the jurisdiction of the Americans with Disabilities Act (ADA) shall be provided as required to comply with all applicable requirements of ADA. It shall be the responsibility of the Contractor and the signage manufacturer to ensure that all signage complies with ADA.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Subject to compliance with the Drawings and Specifications, provide signage by one of the following, or equal approved in writing by the Architect.

ASO/ Mohawk
ASI Sign Systems
Innerface Architectural Signage
Gemini

2.2 INTERIOR SIGNS:

A. All signs shall be manufactured using Graphic Process Series 200A – Sand Carved by Mohawk or approved equal.

B. Tactile characters shall be raised the required 1/32″ inches from sign face. Glue-on letters or etched backgrounds are not acceptable.

C. All text shall be accompanied by Grade 2 braille. Braille shall be separated 1/2″ from the corresponding raised characters or symbols. Grade 2 braille translation to be provided by signage manufacturer.

D. All letters, numbers and/or symbols shall contrast with their background, either light characters on a dark background or dark characters on a light background. Characters and background shall have a non-glare finish.

E. Plaque material shall be melamine plastic laminate, approximately 1/8″ thick with contrasting core color. The melamine shall be non-static, fire-retardant and self-extinguishing. The plastic laminate will be impervious to most acids, alkalies, alcohol, solvents, abrasives and boiling water. All signs are to have radiused corners.

F. Letterform shall be Gill Sans upper case or other san serif or simple serif letterforms.

G. Size of letters and numbers shall be as follows:

1. Room numbers shall be 1″.
2. Lettering for room ID signs shall be 5/8″.
3. Symbol size shall be 4″.
4. Standard Grade 2 braille shall be 1/2″ below copy.

H. Copy position: CC (centered/centered) or as indicated on drawings.

I. Signage shall be sized to accommodate copy. No abbreviations shall be permitted.

J. Provide a sign at each door, including elevators, stairs, toilets., etc. Signage Schedule will be provided.

K. Provide the following signage types: See Signage Package following this Section for additional information.

Type A: 4 ½” x 6” Classroom, Office

Type B & B1: 9” x 6 “Restrooms & Showers

Type C: 4 “x 6” Room Identification
Type C1: 4 ½” x 6” (2-line copy)

Type D: 6” x 9” Stair

Type E: 11” x 46” Directional

Type F: Not Used

Type G: 6” x 10” Elevator

2.3 INTERIOR BUILDING SIGNS: (LOBBY 101)

A. Cut Letters: Flush mount 6” high x ¼” thick brushed aluminum cut letters. Copy for pricing:

1. “Guilford County Sheriff’s Office”

B. Cut Letters: Flush mount 6” high x ¼” thick brushed aluminum cut letters. Copy for pricing:

1. “Pistol Permits / Legal Process.”

C. Sheriff’s Badge: Fabricated aluminum pan sign (custom shape), 2” depth, paint one (1) custom color, full color digital print graphic applied to face, concealed stud mounting.

D. Letters: Font: Arial Bold

PART 3: EXECUTION

3.1 INSTALLATION:

A. Install in accordance with the Drawings, these Specifications, approved Shop Drawings, manufacturer's printed instructions and ANSI requirements.

B. Work shall be level, plumb and in true plane. Work shall be secure and rigid.

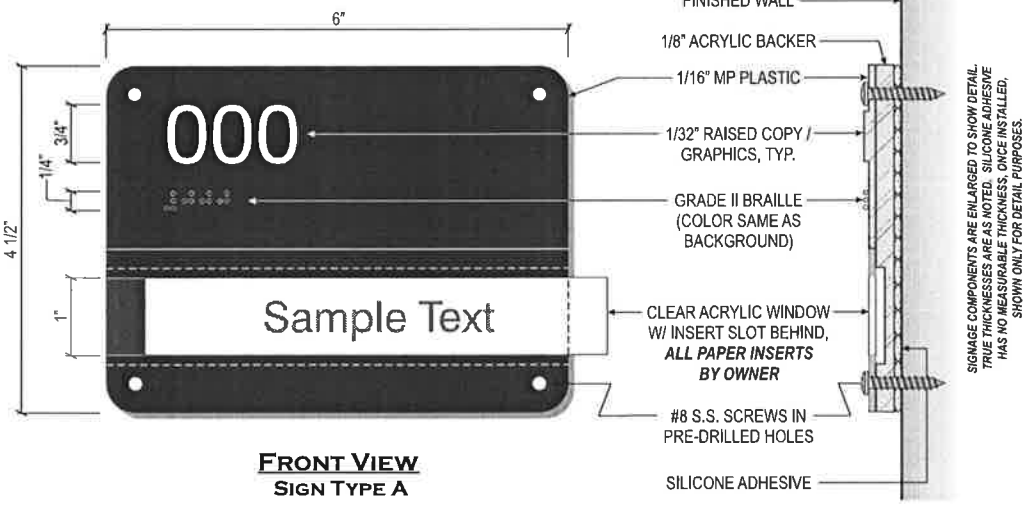
C. Installation accessories shall be furnished by the signage manufacturer. Do not use installation materials from any other source.

D. All interior signs are to be installed using stainless steel screws.

3.2 GUARANTEE:

A. Any signs that do not remain securely bonded to the substrate or otherwise properly installed for a period of 1 year after acceptance of the Project shall be removed and properly reinstalled at no additional cost to the Owner.

END OF SECTION 10 14 00



FRONT VIEW
SIGN TYPE A

SECTION VIEW
TYP. WALL MOUNTED WINDOW SIGN

SIGN TYPE:

SIGN TYPE A

SPECIFICATIONS:

SERIES:	ONE PART BLASTED
MATERIAL:	MP PLASTIC
COPY COLOR:	CHOOSE FROM MFR. STANDARD COLORS
BACKGROUND COLOR:	CHOOSE FROM MFR. STANDARD COLORS
EDGE / CORNERS:	**SQUARE / 3/8" R**
LETTERFORM:	**HELVETICA**
MOUNTING:	#8 STAINLESS STL. SCREWS / ADHESIVE

FRONT VIEW
SIGN TYPE B

FRONT VIEW
SIGN TYPE B (N.T.S.)

FRONT VIEW
SIGN TYPE B (N.T.S.)

SEE PG. 4 FOR TYP. WALL MOUNTED
PANEL SIGN SECTION & DETAILS

SIGN TYPE:

SIGN TYPE B

SPECIFICATIONS:

SERIES:	ONE PART BLASTED
MATERIAL:	MP PLASTIC
COPY COLOR:	CHOOSE FROM MFR. STANDARD COLORS
BACKGROUND COLOR:	CHOOSE FROM MFR. STANDARD COLORS
EDGE / CORNERS:	SQUARE / 3/8" R
LETTERFORM:	HELVETICA
MOUNTING:	#8 STAINLESS STL. SCREWS / ADHESIVE

FRONT VIEW
SIGN TYPE B1

SEE PG. 4 FOR TYP. WALL MOUNTED PANEL SIGN SECTION & DETAILS

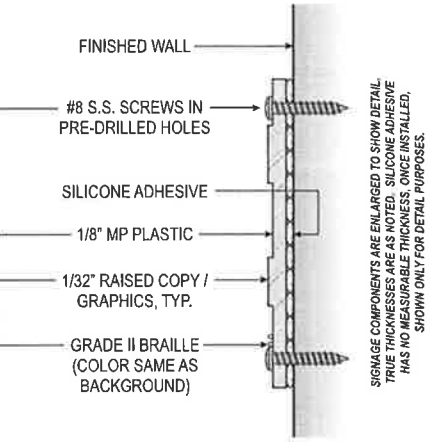
SIGN TYPE:

SIGN TYPE B1

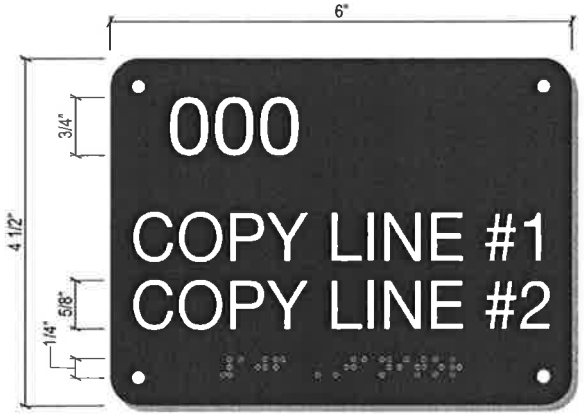
SPECIFICATIONS:

SERIES:	ONE PART BLASTED
MATERIAL:	MP PLASTIC
COPY COLOR:	CHOOSE FROM MFR. STANDARD COLORS
BACKGROUND COLOR:	CHOOSE FROM MFR. STANDARD COLORS
EDGE / CORNERS:	SQUARE / 3/8" R
LETTERFORM:	HELVETICA
MOUNTING:	#8 STAINLESS STL. SCREWS / ADHESIVE

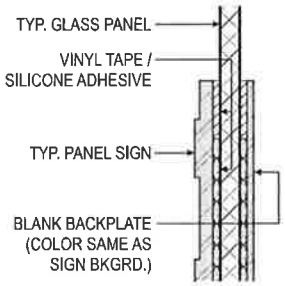
FRONT VIEW
SIGN TYPE C



SECTION VIEW
TYP. WALL MOUNTED PANEL SIGN



FRONT VIEW
SIGN TYPE C1



SECTION VIEW
TYP. GLASS MOUNTED PANEL SIGN

NOTE: GLASS MOUNTED SIGNS DO NOT RECEIVE SCREW HOLES, MOUNTED WITH VINYL TAPE / SILICONE ADHESIVE

SIGN TYPE:

SIGN TYPE C & C1

SPECIFICATIONS:

SERIES:	ONE PART BLASTED
MATERIAL:	MP PLASTIC
COPY COLOR:	CHOOSE FROM MFR. STANDARD COLORS
BACKGROUND COLOR:	CHOOSE FROM MFR. STANDARD COLORS
EDGE / CORNERS:	SQUARE / 3/8" R
LETTERFORM:	HELVETICA
MOUNTING:	#8 STAINLESS STL. SCREWS / ADHESIVE

FRONT VIEW
SIGN TYPE D

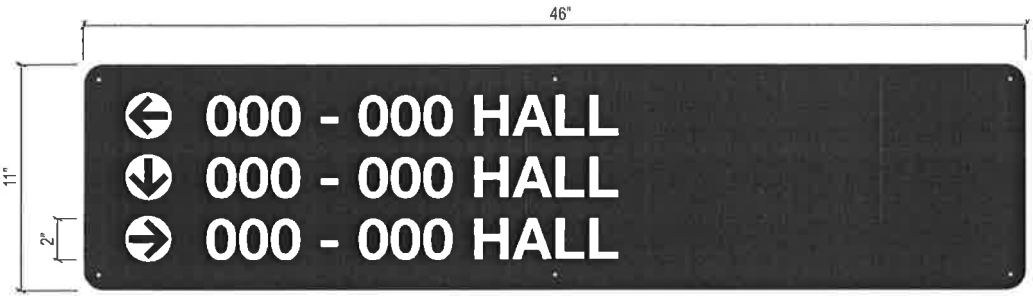
SEE PG. 4 FOR TYP. WALL MOUNTED PANEL SIGN SECTION & DETAILS

SIGN TYPE:

SIGN TYPE D

SPECIFICATIONS:

SERIES:	ONE PART BLASTED
MATERIAL:	MP PLASTIC
COPY COLOR:	CHOOSE FROM MFR. STANDARD COLORS
BACKGROUND COLOR:	CHOOSE FROM MFR. STANDARD COLORS
EDGE / CORNERS:	SQUARE / 3/8" R
LETTERFORM:	HELVETICA
MOUNTING:	#8 STAINLESS STL. SCREWS / ADHESIVE



FRONT VIEW
SIGN TYPE E

FRONT VIEW
SIGN TYPE E (N.T.S.)

FRONT VIEW
SIGN TYPE E (N.T.S.)

SEE PG. 8 FOR TYP. WALL MOUNTED
SUBSURFACE SIGN SECTION & DETAILS

SIGN TYPE:

SIGN TYPE E

SPECIFICATIONS:

SERIES:	SUBSURFACE
MATERIAL:	ACRYLIC
COPY COLOR:	CHOOSE FROM MFR. STANDARD COLORS
BACKGROUND COLOR:	CHOOSE FROM MFR. STANDARD COLORS
EDGE / CORNERS:	SQUARE / 1" R
LETTERFORM:	HELVETICA
MOUNTING:	#8 STAINLESS STL. SCREWS / ADHESIVE

FRONT VIEW
SIGN TYPE F

SEE PG. 4 FOR TYP. WALL MOUNTED PANEL SIGN SECTION & DETAILS

SIGN TYPE:

SIGN TYPE F

SPECIFICATIONS:

SERIES:	ONE PART BLASTED
MATERIAL:	MP PLASTIC
COPY COLOR:	CHOOSE FROM MFR. STANDARD COLORS
BACKGROUND COLOR:	CHOOSE FROM MFR. STANDARD COLORS
EDGE / CORNERS:	SQUARE / 3/8" R
LETTERFORM:	HELVETICA
MOUNTING:	#8 STAINLESS STL. SCREWS / ADHESIVE

FRONT VIEW
SIGN TYPE G

FRONT VIEW
TYP. WALL MOUNTED
SUBSURFACE SIGN

NOTE: PER 2010 ADA GUIDELINES, SECTION 216.3 "DIRECTIONAL & INFORMATIONAL SIGNS", SIGNS THAT PROVIDE DIRECTION TO OR INFORMATION ABOUT INTERIOR SPACES & FACILITIES OF THE SITE SHALL COMPLY W/ 703.5 "VISUAL CHARACTERS." THEREFORE BRAILLE AND/OR RAISED CHARACTERS ARE NOT REQUIRED.

SIGN TYPE:

SIGN TYPE G

SPECIFICATIONS:

SERIES:	SUBSURFACE
MATERIAL:	ACRYLIC
COPY COLOR:	CHOOSE FROM MFR. STANDARD COLORS
BACKGROUND COLOR:	CHOOSE FROM MFR. STANDARD COLORS
EDGE / CORNERS:	SQUARE / 3/8" R
LETTERFORM:	HELVETICA
MOUNTING:	#8 STAINLESS STL. SCREWS / ADHESIVE

SECTION 10 14 43
LUMINOUS EGRESS PATH MARKING SYSTEMS

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Luminous egress path marking systems including photoluminescent strips and nosings.

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 05 51 33 - Metal Ladders.

1.3 REFERENCES

A. ANSI A137.1 Flooring Slip Resistance.

B. ASTM E2072 - Standard Specification for Photoluminescent (Phosphorescent) Safety Markings.

C. ASTM E2073 - Standard Test Method for Photopic Luminance of Photoluminescent (Phosphorescent) Markings.

D. International Building Code (IBC).

E. International Fire Code (IFC).

F. NFPA 101 - Life Safety Code.

G. NC Building Code (NCSBC)

H. NC Fire Prevention Code (NCFPC)

1.4 DESIGN REQUIREMENTS

A. Luminous egress path markings are not specifically shown on the drawings but are required to be provided in full compliance with Section 1024 of the North Carolina State Building Code.

B. Provide specified products for stairs in compliance with International Building Code Section 1024, International Fire Code Section 1104, NFPA 101 Life Safety Code.
   1. Retrofit Nosings 2 inches (51 mm) aluminum nosing with 1-inch (25 mm) photoluminescent strip for existing stairs.
   2. Pour-in-Place Nosings 2 inches (51 mm) clip on nosing assembly with 1-inch (25 mm) photoluminescent strip for new pan-filled stairs.
   3. Cast-in-Place Nosings 2 inches (51 mm) assembly with 1-inch (25 mm) photoluminescent strip for new concrete insertion.
   4. Standard Nosing 1-1/2 inches (38 mm) aluminum nosing with 1-inch (25 mm) photoluminescent strip for Steel Stair Manufactures.
   5. Railing Strips 1 inch (25 mm) pre-curved photoluminescent strip for round railing.
   6. Perimeter Marking 1-inch (25 mm) photoluminescent strip for egress markings.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00 - Submittals - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Provide CAD or PDF drawings of nosing details.

D. Verification Samples: For each finish product specified, two samples representing actual product, color, and patterns.
   1. Retrofit Nosing 8 inches (203 mm) long with/ without construction cover.
   2. Pour-in-Place Nosing 8 inches (203 mm) long complete assembly.
   3. Cast-in-Place Nosing 8 inches (203 mm) long complete assembly.
   4. Standard Nosing 8 inches (203 mm) long, includes construction cover.
   5. Railing Strip 8 inches (203 mm) long, peel and stick adhesive included.
   6. Perimeter Marking 8 inches (203 mm) long, peel and stick adhesive included.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5-year experience manufacturing similar products.

B. Installer Qualifications: Minimum 2-year experience installing similar products.

C. Slip Resistance: Provide units which comply with ADA, OSHA and local building codes and insurance requirements.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship is approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.7 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Protect from damage. Store in cool, dry location until installed.

C. Handling: Handle materials to avoid damage.

1.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.10 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.11 WARRANTY

A. Products shall carry a one-year warranty to cover defects in materials and workmanship, limited to repair or replacement.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. For purposes of describing type and quantity of markings required, the drawings and specifications are based upon the manufacturer listed. Acceptable Manufacturer: Subject to compliance with the Drawings and Specifications, provide the following, or equal approved in writing by the Architect.
   1. Safe-T-Nose, which is located at: 1640 Salem Industrial Dr. NE PO Box 8387; Salem, OR 97305; Toll Free Tel: 855-723-6673; Tel: 503-362-3554; Fax: 503-362-5884; Email: request info (sales@safetnose.com); Web: www.safetnose.com

B. Similar and equal products will be acceptable for this Project when the specified submittals are approved in writing by the Architect.

2.2 MATERIAL

A. Photoluminescent Material: Photoluminescent layers "Photo-Glo" on plastic substrates.
   1. Luminance Test: The samples tested meet the requirements of ASTM E2072-14, para. 4.1.1.
      a. Excitation Parameters:
         1) Duration: 60 minutes.
         2) Illuminance lux: 10.76.
      b. Luminance (mcd/sq m):
         1) After 10 minutes: 99.3.
         2) After 60 minutes: 16.9.
         3) After 90 minutes: 7.98.

2.3 COMPONENTS

A. Stair Nosings - Photoluminescent:
   1. 1 inch (25 mm) wide photoluminescent material (Photo-Glo) adsorbing and storing energy from ambient light, not requiring external power supply.
   2. Aluminum Alloy 6063-T5 for durable nosing base material.
   3. STNP and STNC isolators made of Georgia Gulf 7181 for weatherability, impact strength, flame and chemical resistance.
   4. Patented Construction Covers - no protective taping or tape removal.

B. Railing Strip - Photoluminescent:
   1. 1 inch wide x 10 inches (25 mm x 254 mm) long contoured dome for round railing made of durable and easy to clean "golf ball" material cuts easily with scissors - no end caps required peel and stick - no additional adhesives required.

C. Perimeter Marking - Photoluminescent:
   1. 1 inch wide x 100 feet (25 mm x 30480 mm) long roll, beveled edge to lay flat made of durable and easy to clean "golf ball" material cuts easily with scissors - no waste peel and stick - no additional adhesive required.

D. Compliance:
   1. Luminous Egress Path Marking Systems:
      a. UL 1994 - Luminous Egress Path Marking Systems.
      b. CAN/ULC-S572 - Photoluminescent and Self-Luminous Exit Signs and Path

Marking Systems.

2. Slip Resistance: ANSI A137.1 Dynamic Coefficient of Friction Test.
   a. Average Dynamic Coefficient of Friction (DCOF), cleaned with Renovator #120, and tested with BOT-3000E digital tribometer using SBR rubber slider and 0.05% SLS water solution: Overall average: Dry: 0.50; Wet: 0.42.

2.4 NOSINGS

A. Retrofit Nosings.

B. Cast in Place Nosings.

C. Nosings For Steel Stair Manufacturers.

D. Pour-In-Place Nosings For Steel Pan Stairs.
   1. For use on steel pan stairs with 3/4" steel pan lip (14ga. to 11ga. steel).
   2. Plastic isolator is designed to clip onto the front lip of the riser of steel pan just before the concrete is poured. This clip-on application holds the nosing in place prior to concrete pour only. Do not walk on or disturb the nosing prior to concrete pour. Isolator adds contrasting color to top and front of tread.

E. Vinyl Treads.

2.5 PHOTOLUMINESCENT STRIPS

A. Photoluminescent Handrail Strips.

B. Photoluminescent Perimeter Strips.

PART 3 EXECUTION

3.1 EXAMINATION

A. Before installation, examine surfaces for appropriate application. Do not begin installation until substrates have been properly prepared. Commencement of work will imply acceptance of surfaces.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces to remove dirt, dust, grease, oil, loose material or other matter that may affect bonding of photoluminescent products.

B. Test substrates for compatibility before using other adhesives or mechanical fasteners.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved submittals.

B. Install products to be plumb, square and in alignment where required.

C. Follow supplied instructions.

3.4 PERIMETER MARKING INSTALLATION

A. Thoroughly clean the surface area where the strip will be installed with a dry cloth and nonresidue cleaning compound to remove and loose particles and dirt. Surface must be dry and dust free.

B. Cut to length with scissors.

C. Peel the backing from the strip without touching the adhesive.

D. Place the strip and starting from one end to the other, firmly press the strip onto the installation surface. Be sure that the strip has full contact with the surface.

3.5 HANDRAIL STRIP INSTALLATION

A. Thoroughly clean the surface area where the strip will be installed with a dry cloth and nonresidue cleaning compound to remove and loose particles and dirt. Surface must be dry and dust free.

B. Cut to length with scissors.

C. Peel the backing from the Handrail Strip without touching the adhesive.

D. Place the strip and starting from one end to the other, firmly press the strip onto the handrail.

E. Be sure that the strip has full contact with the railing.

3.6 NOSING INSTALLATION

A. Pour in Place Installation:
   1. Verify the front lip of the riser surface is clean, dry, flat, and smooth.
   2. Verify the front lip of the riser is no greater than 3/4 inch (19 mm) in length.
   3. Clip in place the nosing isolator onto the front lip of the riser.
      a. Verify the nosing assembly is level and secure.
      b. Verify the nosing construction cover is secure.
   4. Fill pan with concrete.
      a. Concrete to be flush with top of construction cover.
      b. Trowel joint at back of construction cover.
   5. Remove the construction cover after concrete is fully dry and all painting and cleanup is complete.

B. Retrofit Installation:
   1. Verify the surface is clean, dry, flat and smooth.
      a. On concrete, use a leveling compound if necessary to provide a level/smooth surface.
      b. Use dry cloth and non-residue cleaning compound to remove dirt and grime.
   2. Use construction grade (water resistant) adhesive, with mechanical fasteners if possible.
      a. Recommended Mechanical Fasteners: flathead 1/8 inch (3 mm) diameter wood screws, concrete screws or metal rivets if tread construction allows.
      b. Recommended Adhesive: Bostik 1100FS or 70-03A.
   3. If mechanical fasteners are used:
      a. Place nosing in place, centered on front edge of tread.
      b. Predrill holes from top side of nosing, through Photo-Glo strip and aluminum nosing into tread material.
      c. Hole location 1 to 2 inches (25 mm to 51 mm) from each end of nosing and

spaced equally every 12 to 24 inches (305 mm to 610 mm).

4. If adhesive is used: Apply continuous bead of adhesive (centered) on underside of nosing.
5. Place and press nosing centered on front edge of tread.
   a. Install mechanical fasteners.
   b. Allow adhesive rated cure time before stair use.

C. Cast in Place Installation:
1. Verify the wet concrete surface is smooth and level.
2. Push the nosing (centered, front edge of riser) into the wet concrete with the plastic isolator embedded in the concrete.
3. Top of construction cover shall be level with the surface of the concrete.
4. Trowel joint at back of construction cover.
5. Remove the construction cover after concrete is dry fully and all painting and cleanup is complete.

D. Keep construction covers on as long as practical to protect nosings during construction.

3.7 INSTALLATION INSPECTION:

A. Check regularly for loose nosing's or damaged components. Replace damaged components, repair delaminated Photo-Glo components as required. Tighten loose fasteners as needed.

3.8 PHOTOGLO CHARGE INSTRUCTION:

A. Minimum of 1-foot candle (11 Lux) of fluorescent, incandescent or LED (light emitting diode) for 60 Minutes is required to charge Photo-Glo.

B. Control of lighting restricted to authorized personnel. Reliable external illumination is required at all times during building occupancy.

C. Do not use Photo-Glo where the ambient illumination level is less than 1-foot candle (11 Lux).

3.9 CLEANING

A. Cleaning: Clean Work of this Section prior to Substantial Completion.
1. Establish a regular inspection schedule for the photoluminescent components and clean them as needed to prevent dirt, etc. from inhibiting the performance of the components. Safe-T-Nose, Inc. recommends inspection at least annually or after any particularly heavy use. Perform inspections in accordance with applicable local and national code requirements.
2. Photoluminescent components attached to floor assemblies may be cleaned by mopping, using high-pressure water (NO STEAM CLEANING) or wiping with a clean damp cloth. Use mild detergents to clean the photoluminescent components, if necessary. Mild dish washing detergents or laundry detergents are recommended. Do not use highly alkaline detergents, those having a ph > 8, or acidic cleaners, those having a ph < 5. Do not use abrasive cleaners. Photoluminescent components on walls or other assemblies or components may be cleaned using clean water and a clean sponge or a clean cotton cloth. Rinse after applying detergent solution. Wipe with a clean cotton cloth to dry.
3. Regular Maintenance:
   a. Inspect exit path markings, obstacle markings and photoluminescent stair nosings for damaged components and to ensure that photoluminescent components remain properly attached to their substrate and that no loosening of anchors or delamination of photoluminescent components has occurred.
   b. Replace damaged components. Repair delaminated photoluminescent

components. Contact the factory for repair recommendations. Delaminated photoluminescent components in stair nosings can result in trip hazard.

3.10 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 10 14 43

SECTION 10 21 13
SOLID PLASTIC TOILET PARTITIONS

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Toilet accessories (Section 10 28 00).

B. Work Included This Section:

1. Furnish and install solid plastic, high density polyethylene, floor mounted overhead braced toilet compartments and floor mounted overhead braced urinal screens as shown on Drawings and as specified herein.

2. All supplementary components and accessory materials required for a complete and proper installation shall be furnished by the toilet partition manufacturer.

1.3 SUBMITTALS:

A. Shop Drawings:

1. Drawings shall show layout and details of construction and erection for all conditions. Include materials, colors, finishes and hardware.

2. Data shall include manufacturer's printed specifications with portions marked which are applicable to the work of this Section.

B. Manufacturer's Data: Submit manufacturer's printed installation instructions.

C. Samples: Submit manufacturer's full color charts and samples of finish for selection of Project colors by the Architect.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS: Subject to compliance with the Drawings and Specifications, provide toilet partitions by one of the following, or equal approved in writing by the Architect:

Accurate
Ampco Products Inc.
PSI SC
Scranton
ASI

A. Source: Products for use on this Project shall be of one manufacturer unless noted specifically otherwise herein.

2.2 GENERAL:

A. Handicap Toilet Compartments:

1. On compartments designated for the handicapped, compartment doors shall swing out and furnish a clear width of 32" with operating hardware complying with Volume 1-C, 11.4.4 (ADAAG 4.17.5)

2. Compartments for the handicapped shall be furnished with grab bars on each side and all other special accessories shown on the Drawings.

B. Toilet Accessories Specified Elsewhere:

1. Shall be furnished and installed under Section 10 28 00. The toilet partition manufacturer shall be responsible for obtaining information for such accessories and preparing the partitions as required to receive the specified accessories.

2.3 PRODUCTS:

A. Standard: Toilet compartments and urinal screens shall be Standard Solid Plastic Floor Mounted/Overhead Braced Compartments, Class A fire rated, mfd. by Scranton, or equal approved in writing by the Architect by other manufacturers listed in Paragraph "Acceptable Manufacturers".

B. Materials: All materials, panels, doors, pilasters, and screens, shall be fabricated from high density polyethylene (solid plastic) under high pressure forming a single component section that is waterproof, corrosion-proof, impact-resistant, and non-absorbent and resists marking with pens, pencils, lipsticks, and other writing or marking implements.

C. Construction:

1. All partitions, including doors, pilasters and divider panels, shall be 1" thick, with all edges radiused and all sharp corners removed. All dividing panels and doors shall be 55" high and mounted 14" above finished floor.

2. All pilasters shall be 82" high and fastened to 3" high solid plastic shoes by means of theft-proof stainless-steel sex bolts. To ensure a mar-free finish, all plastic components are to be covered with protective film or finish.

D. Hardware:

1. Provide the partition manufacturer’s continuous aluminum hinge, spring loaded, 54”. Hinge is surface mounted and predrilled for field applied stainless steel screws into door and pilaster.

2. Headrail shall be heavy duty extruded aluminum (6063-T5) anti-grip bright-dip anodized aluminum.

3. Door latches, strike and keeper are to be heavy duty extruded aluminum (6063-T5) with bright-dip anodized finish.

4. Provide solid plastic continuous wall brackets full height of panels at walls and pilasters.

5. Screws and bolts shall be stainless steel and furnished by the partition manufacturer.

E. Floor Mounted Overhead Braced Urinal Screens: Provide screen from same material and thickness as the toilet partition panels, 42” high by 18” deep unless shown otherwise on the Drawings. Pilaster is to match pilasters for the toilet partitions. Attach screen to wall and to pilaster with solid plastic continuous brackets. Overhead bracing for pilaster is to be same as for the toilet partitions.

PART 3: EXECUTION

3.1 INSTALLATION:

A. Installation shall be in accordance with the manufacturer's published instructions and in accordance with shop drawings approved by the Architect.

B. All exposed and visible hardware, including screws, bolts, anchors, etc., shall be furnished by the partition manufacturer. No common hardware purchased locally, such as screws, bolts, etc., shall be used.

C. Ensure that all anchors into walls and floors are of the proper type and are properly installed to provide the maximum strength.

D. Coordinate with Section 10 28 00, Toilet Accessories, to ensure that all items specified therein are properly provided for.

END OF SECTION 10 21 13

SECTION 10 28 00
TOILET ACCESSORIES

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Toilet compartments (Section 10 21 13).

B. Work Included in This Section:

1. Toilet room accessories as shown on Drawings and as specified herein, including all installation accessories required for a complete and proper installation, ready for use.

1.3 INDUSTRY STANDARDS:

A. References: Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used):

The American Society for Testing and Materials (ASTM)
American Iron and Steel Institute (AISI)
Aluminum Association (AA)

1.4 SUBMITTALS:

A. Shop Drawings: Indicate location, arrangement, dimensions, mounting heights, anchorage, materials, finishes, hardware and relation to adjacent work.

B. Manufacturer's Data: Submit (in duplicate) manufacturer's illustrations and technical data giving materials, dimensions, thickness of parts, function, installation instructions and operating and maintenance instructions.

C. Guarantee: Submit (in duplicate) manufacturer's ten (10) year mirror guarantee against silver spoilage. Guarantee shall show name of Project, name of Owner, location and date of final acceptance.

D. Samples: Furnish samples of each item in finish specified for Architect's review. Samples will be returned and may be installed in the Project and will be used as a basis for comparing other like material items.

E. Cut-out Templates: Furnish templates to other trades for items recessed into finish materials.

1.5 PROTECTION:

A. Protect toilet accessories from physical damage until final acceptance of the Project.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS: Subject to compliance with the Drawings and Specifications, provide product by one of the following, or equal approved in writing by the Architect:

A & J Washroom Accessories
American Infant Care Products Inc.
American Specialties Inc.
Bobrick Washroom Equipment Inc.
Bradley
General Accessory Manufacturing Co.
Koala Corporation
McKinney/Parker Inc.

2.2 MATERIALS:

A. Stainless Steel: AISI Alloy Type 304 with #4 satin finish.

B. Aluminum Extrusions: AA Alloy 6063-T6, except as specified otherwise.

C. Exposed faces shall not have any embossed or applied names.

D. All coin operated Sanitary Napkin Dispensers shall be keyed alike but different from other accessories. All other accessories shall be keyed alike.

2.3 ACCESSORIES:

A. The accessories are selected from Bobrick Equipment Company only to clearly describe type and quality intended. Products of other manufacturers listed hereinbefore may also be provided when the specified submittals are approved in writing by the Architect.

B. See the Drawings for the Schedule of Toilet Accessories required.

C. All accessories to be installed with tamper resistant fasteners.

PART 3: EXECUTION

3.1 INSTALLATION:

A. Install toilet accessories after the completion of tile, plaster, painting, partitions and plumbing work.

B. Protect room and material finishes from damage. Damaged finishes and materials shall be replaced at no additional cost to the Owner.

C. Install toilet accessories in accordance with manufacturer's printed instructions. Mount securely, plumb and level. Mount symmetrically to plumbing fixtures, unless shown otherwise elsewhere in the Contract Documents or on approved Shop Drawings. Mount multiple units in a true, level line and uniformly spaced. Flanges of recessed units shall be snug to adjacent surfaces.

3.2 CLEAN-UP:

A. Upon completion of installation, remove all debris and broom clean floors.

B. Clean and polish all toilet accessories.

END OF SECTION 10 28 00

SECTION 10 35 00
FLAGPOLE

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Concrete (Section 03 30 00).

B. Work Included in This Section:

1. Provide one (1) flagpole assembly as shown on Drawings and as specified herein, including all accessories required for a complete installation, ready for use.

1.3 INDUSTRY STANDARDS:

A. References: Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used):

Aluminum Association (AA)
Federal Specifications (FS)

1.4 SUBMITTALS:

A. Shop Drawings: Show arrangement, dimensions, materials, finishes, fittings, connections and relation to adjacent work.

B. Manufacturer's Data: Submit (in duplicate) manufacturer's printed installation instructions.

PART 2: PRODUCTS

A. Flagpole:

1. Flagpole assembly complete with fittings and equipment. One of the followings:

a. Cone-Tapered Aluminum Flagpole as mfd. by Baartol Co., Inc.

b. Cone-Tapered Aluminum Flagpole as mfd. by American Flagpole Division of Kearny-National, Inc.

c. Commercial Groundset Flagpole by AABEC Pole Division of Morgan-Francis Co.

2. Pole:

a. Fabricate pole from seamless aluminum tubing with minimum wall thickness of 0.188". Fabricate from AA aluminum alloy 6063-T6, heat-treated.

b. Total height above the ground shall be 30 ft. Setting depth shall be 3 ft.

(1) Upper portion of flagpole shall be tapered and shall be not less than 13'-9" in length. Outside diameter at top shall not be less than 3 1/2". Bottom diameter shall not be less than 6".

(2) Exterior surface shall be smooth without offsets or visible joints.

(3) Provide a field-joint that is self-aligning, close fitting and neat without field welding or bolting.

c. Finish shall be clear spun aluminum. Coat portion to be inserted in foundation tube with a heavy coat of black asphaltum.

B. Flashing Collar: Provide standard spun-aluminum flashing collar finished to match pole.

C. Flagpole Truck: Provide bronze, non-fouling, revolving truck with two (2) bronze sheaves with self-lubricating bearings. Truck shall be supported on stainless-steel ball-bearings.

D. Cleats: Provide two (2) standard 9" cast aluminum cleats bolted to pole with 5/16" diameter aluminum bolts. Drill and tap pole to receive bolts.

E. Ball: Provide 6" diameter satin finished aluminum ball. Mount ball on flagpole truck with aluminum tubing. Finish to match the flagpole.

F. Halyard:

1. Provide with two (2) 5/16" white polypropylene rope halyards.

2. Provide with chrome-plated bronze flagsnaps spliced to the halyard.

3. Provide with white vinyl flagsnap covers.

G. Foundation Tube:

1. Tube shall be 16 ga. hot-dipped galvanized corrugated steel tubing, 10" in diameter.

2. Base plate shall be not less than 1/4" thick steel plate, 1'-4" square, welded to bottom of corrugated steel tube.

3. Provide 1/4" thick steel support plate welded to grounding spike.

4. Provide with 3/4" diameter steel rod grounding spike welded to base plate. Spike shall extend not less than 1'-0" below concrete footing.

5. Provide steel centering wedges welded to base plate.

6. Provide either centering bolts or loose wedges at top of tube for plumbing pole after erection.

7. Exposed portions of foundation tube and base plate shall be given a shop coat of red lead and oil paint conforming to Federal Specification FS TT-P-86.

PART 3: EXECUTION

3.1 INSTALLATION

A. Install in accordance with the Drawings, these Specifications, approved shop drawings and the manufacturer's published instructions.

END OF SECTION 10 35 00

SECTION 10 41 00
BUILDING DIRECTORY

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Gypsum drywall (Section 09 29 00).

B. Work Included in This Section:

1. Extruded aluminum frame Interior Building Directory with individual lift-out glass front to be mounted as shown on Drawings and as specified herein.

1.3 SUBMITTALS:

A. Shop Drawings:

1. Show location, arrangement, dimensions, materials, finishes, connections, anchorage and relation to adjacent work.

B. Manufacturer's Data:

1. Submit (in duplicate) manufacturer's printed specifications and installation instructions for work of this Section.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS: Products of the following manufacturers will be acceptable for use for the following specific functions for the Project when approved (in writing) by the Architect for the function, arrangement and compatibility with other work in the Project:

Architectural Graphics, Inc.
ASI Sign Systems
Spanjer Brothers, Inc.

A. Standard: For purposes of designating type and quality for the work under this Section, Drawings and Specifications are based on products manufactured or furnished by Andco Industries.

2.2 MATERIALS:

A. Building Directory:

1. Product shall be 2500D Series Model HDMI non-illuminated flush mounted directory.

2. Directory shall be 31” high by 15” wide.

3. Frame shall be manufactured frame 22” x 3/4” aluminum extrusions. Finish shall be

standard natural clear anodized aluminum.

4. Engraved plastic name strips, 1/2” x 9 1/2”, shall be furnished. Strips shall change easily and align automatically. Color of letter strips shall be standard black.

5. Directory shall have an individual lift-out glass front for easy access for changing name strips.

6. Directory shall be provided with a total of 1000 1/2” white Helvetica Acrylic Letters.

PART 3: EXECUTION

3.1 COORDINATION:

A. Coordinate the installation of Building Directory with the work of other trades.

3.2 INSTALLATION:

A. Install in accordance with approved Shop Drawings and in accordance with manufacturer's printed installation instructions.

B. Directory shall be mounted flush to wall with concealed fasteners.

C. Directory shall be level, plumb and in true plane. Work shall be secure and rigid.

END OF SECTION 10 41 00

SECTION 10 50 00
LOCKERS

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Furnish and Install:

1. Double-tier and three-tier metal lockers as shown on the Drawings and specified herein.

2. Include all installation accessories required for a complete and proper installation, ready for use.

1.3 SUBMITTALS:

A. Shop Drawings: Indicate location, arrangement, dimensions, mounting heights, anchorage, materials, finishes, hardware and relation to adjacent work.

B. Manufacturer's Data: Submit (in duplicate) manufacturer's technical data giving materials, thickness of parts, function and installation instructions.

C. Manufacturer's Color Chart: Showing a minimum of twenty (20) different colors from which locker colors will be selected by the Architect.

1.4 PROTECTION:

A. Protect lockers from physical damage until final acceptance. Protect by means of heavy coverings or other equal means.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS: Products complying with the Drawings and these Specifications by the following manufacturers will be acceptable for the Project when the specified submittals are approved in writing by the Architect.

All American Lockers Inc.
Art Metal Products
Lyon Metal Products Inc.
Penco Products Inc.
Republic Storage Systems Co.

2.2 MATERIALS:

A. All lockers are to be 12” W x 12” D, overall heights are 72” excluding base. Doors and door frames shall be fabricated from cold rolled and stretcher leveled sheet steel. Other parts shall be fabricated from mild cold rolled steel. All steel shall be free from imperfections and capable of taking a high grade baked on enamel finish.

2.3 LOCKERS:

A. Furnish with 12-gauge "Z" type base, 4" high, with front recessed behind face of locker to provide foot space; with manufacturer's baked enamel finish.

B. Furnish with continuous one-way sloping steel tops with finish to match lockers.

C. Doors:

1. Shall be 16-gauge steel, one-piece construction adequately flanged. Construction shall consist of two (2) right angles at hinge side and one (1) right angle formation at other edges, or structurally equal fabrication.

2. All flanges shall be welded together at corners.

3. Doors shall have manufacturer's standard louver vents at top and bottom of each door.

D. Door Frames:

1. Shall be not less than 16-gauge steel capable of taking same high-grade finish as balance of locker.

2. All parts to be channel formation securely welded together. Sides of frame shall form a continuous door strike.

E. Locking Device and Handles:

1. Locking device shall engage frame at a minimum of two points.

2. Locking to be by masterkeyed combination padlock. Provide one padlock for each locker, with masterkeys.

3. All handle parts, including fixed case and lifting trigger to be made from sturdy zinc die cast metal with tensile strength not less than 40,000 psi. Padlock attachment to be integral part of lift which shall be attached directly to locking bar and protected by fixed handle housing.

F. Rubber Silencers:

1. Doors and locking devices shall be furnished with rubber silencers to prevent metal to metal contact during operation.

G. Hinges:

1. Shall be at least 2" wide of the full-loop, tight pin style, minimum .050" steel, 5-knuckle type, securely attached to frame and door. Locker doors shall have minimum of two hinges.

H. Body:

1. All locker body components shall be made of 24 gauges cold rolled steel specially flanged for added strength and rigidity to insure tight joints between bolts. All bolts and nuts shall be zinc plated or equal rust-retardant treatment.

I. Finish:

1. All exposed steel parts, including inside of doors and inside of lockers, shall be thoroughly cleaned and finished with a primer coat and finish coat of baked-on enamel. There shall be no runs or blisters; only a smooth surface shall be

accepted. Where bolt heads are visible on the exterior, they shall be finished to match the surface upon which they are attached. Bolts and nuts shall be rustproofed before finishing.

J. Number Plates:

1. Each locker shall have an aluminum number plate with black numerals not less than 3/8" high. Plates to be attached near top of door.

K. Coat Hooks:

1. All lockers shall have one double prong ceiling hook and three single prong wall hooks on sides and back. All hooks shall have ball points and shall be made of steel. All hooks shall be attached with two (2) bolts or rivets.

L. Ventilation:

1. Doors shall be louvered at top and bottom for ventilation.

M. Miscellaneous:

1. Provide end finishing strips, filler panels and cover plates to properly and neatly trim out the lockers to walls. Minimum 18 gauge and finish to match lockers.

2.4 Locker Types:

A. Shower Room Lockers (Rooms 710 & 711): Two tiered. Provide 12 two tiered for a total of 24 thirty-six inches high lockers.

B. Probation & Parole Lockers (Room 324): Three tiered. Provide 26 three tiered for a total of 78 twenty-four inches high lockers.

PART 3: EXECUTION

3.1 INSTALLATION:

A. Install lockers and benches in true alignment, plumb and secure as detailed and in locations shown on the Drawings.

B. Installation to be in accordance with the manufacturer's written instructions and approved shop drawings.

END OF SECTION 10 50 00

SECTION 10 52 00
FIRE PROTECTION SPECIALTIES

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. GWB walls (Section 09 29 00).

2. Masonry walls (Section 04 20 00).

3. Plumbing work (Division 22).

B. Furnish and Install:

1. Fire extinguisher cabinets.

2. Fire extinguishers.

3. All accessory materials required for a complete and proper installation.

1.3 SUBMITTALS:

A. Shop Drawings: Indicate location, arrangement, dimensions, mounting heights, anchorage, materials, finishes, hardware, and relation to adjacent work.

B. Manufacturer's Data: Submit manufacturer's technical data giving materials, thickness of parts, function, installation instructions and plumbing connection data.

1.4 PROTECTION:

A. Protect materials and equipment from physical damage until final acceptance.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS: Products, that comply with the Drawings and these Specifications, by the following manufacturers will be acceptable for use for the Project when the specified submittals are approved in writing by the Architect.

J. L. Industries Inc.
Larsen's Mfg. Co.
Potter-Roemer Inc.

2.2 MATERIALS:

A. Fire Extinguisher Cabinet:

1. Larsen's Cameo Series, Model C2409-R Fire Extinguisher Cabinet, or approved equal, fully recessed, with aluminum framed acrylic bubble door and flat trim

projecting 5/16" from wall.

a. Cabinet box to be of heavy gauge steel with white baked enamel finish.

b. Wall trim to be of extruded aluminum with satin anodized finish.

c. Door to include 1" wide aluminum frame with satin anodized finish, 1/8" thick clear acrylic bubble with chrome plated pull knob, magnetic catch and continuous piano hinge which matches the wall trim.

d. Inside dimensions of the box to be 24"h x 9 1/2"w x 3 1/2"d. If product by other acceptable manufacturers listed hereinbefore is provided, the cabinet inside dimensions shall meet these specified dimensions.

e. Provide red vertical letters “FIRE EXTINGUISHER” on door bubble.

f. Fire extinguisher and extinguisher mounting brackets furnished by the Owner.

B. Fire Extinguishers:

1. Larsen’s Multi-Purpose Dry Chemical MP6, 5” cylinder diameter, 16” height, 7 ¾” overall width, UL Rating 3A-40BC, Factory Mutual approved.

2. In addition to fire extinguishers required at each Fire extinguisher cabinets, provide 20 additional fire extinguishers to be located as directed by the Owner.

C. Fire Extinguisher Brackets:

1. Larsen’s B-2 Bracket, or approved equal, constructed of heavy gauge steel with white baked enamel finish.

2. Bracket shall be sized to accommodate any fire extinguisher that will fit into the cabinet specified herein before.

PART 3: EXECUTION

3.1 INSTALLATION:

A. See Drawings for locations and wall construction to receive units.

B. Coordinate cabinet installation with work of other related Sections. Install in accordance with manufacturer's written instructions.

C. Provide all accessory materials required for a complete and proper installation.

D. Center of cabinets to be mounted 48" above floor.

END OF SECTION 10 52 00

SECTION 12 30 40
LAMINATE CLAD CASEWORK

PART 1: GENERAL

1.1 SECTION INCLUDES:

A. Fixed modular laminate clad casework and components.

B. Countertops.

C. Cutouts for service fixtures in all tops and cabinetry.

D. Reception Desk at Room 185, Service Counters at Waiting 102, and all other locations shown on the drawings.

1.2 RELATED SECTIONS:

A. Blocking within walls where indicated: Division 6.

B. Millwork, trim, and custom cabinetry: Division 6.

C. Base molding: Division 9.

D. Sinks and service fixtures, service waste lines, connections and vents.

E. Electrical service fixtures: Division 26.

1.3 DEFINITIONS: Work of this Section is all laminate clad casework, countertops, cabinets, reception desk, mailboxes, and related items specified.

A. Identification of casework components and related products by surface visibility.

1. Open Interiors: Any open storage unit without solid door or drawer fronts.

2. Closed Interiors: Any closed storage unit behind solid door or drawer fronts, sliding solid doors.

3. Exposed Ends: Any storage unit exterior side surface that is visible after installation.

4. Other Exposed Surfaces: Faces of doors and drawers when closed, and tops of cabinets less than 72 inches above furnished floor.

5. Semi-Exposed Surfaces: Interior surfaces which are visible, bottoms of wall cabinets and tops of cabinets 72 inches or more above finished floor.

6. Concealed Surfaces: Any surface not visible after installation.

1.4 QUALITY ASSURANCE:

A. Manufacturer: Minimum of 5 years experience in providing manufactured casework systems for similar types of projects, produce evidence of financial stability, bonding capacity, and adequate facilities and personnel required to perform on this project.

1.5 SUBMITTALS:

A. Comply with Section 01 33 00, unless otherwise indicated.

B. Product Data: Manufacturer's catalog with specifications and construction details.

C. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.

1. Include section drawings of typical and special casework, work surfaces and accessories.

2. Indicate locations of plumbing and electrical service field connection by others.

D. Casework Samples:

1. Base cabinet: Cabinet conforming to specifications, with drawer and door.

2. Wall cabinet: Cabinet conforming to specifications, with door.

3. Cabinet samples shall be complete with specified hardware for doors, drawers and shelves.

4. Component samples: Two sets of samples for each of the following:

a. Decorative laminate color charts.
b. PVC edgings.

1.6 PRODUCT HANDLING:

A. Deliver completed laminate clad casework, countertops, and related products only after wet operations in building are completed, store in ventilated place, protected from the weather, with relative humidity range of 20 percent to 50 percent.

B. Protect finished surfaces from soiling and damage during handling and installation with a protective covering.

1.7 JOB CONDITIONS:

A. Environmental Requirements: Do not install casework until permanent HVAC systems are operating and temperature and humidity have been stabilized for at least 1 week.

1. Manufacturer/Supplier shall advise Contractor of temperature and humidity requirements for architectural casework installation areas.

2. After installation, control temperature and humidity to maintain relative humidity between 25 percent and 55 percent.

B. Conditions: Do not install casework until interior concrete work, masonry, plastering and other wet operations are complete.

1.8 WARRANTY:

A. Lifetime Guarantee and Limited Warranty to the original owner against defective material and fabrication for as long as they own the product. This is a warranty of replacement and repair only; manufacturer will correct defects in material and/or fabrication without charge.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS: In order to describe the type and quality of casework required the Drawings, Specifications and Model numbers listed are based on Products by TMI Systems Design Corporation.

A. Subject to compliance with the Drawings and Specifications products by the following manufacturers will be accepted for work on this Project.

Cabinets by Design
Custom Wood Products
Interior Wood Specialties
LSI Corporation of America
TMI Systems Design Corporation.

2.2 MATERIALS:

A. Core Materials:

1. Particleboard up to 7/8-inch-thick: Industrial Grade average 47-pound density particleboard, ANSI A 208.1-1999, M-3.

2. Particleboard 1 inch thick and thicker: Industrial Grade average 45-pound density particleboard, ANSI A 208.1-1999, M-2.

3. Moisture resistant particleboard: Average 47-pound density particleboard, ANSI 208.1 1-1999, M-3

B. Hardboard: 1/4-inch-thick prefinished medium density particle board.

C. Decorative Laminates:

1. High-pressure decorative laminate VGS (.028), NEMA Test LD 3-1995.
2. High-pressure decorative laminate HGS/HGP (.048), (.039), NEMA Test LD 3-1995.
3. High-pressure cabinet liner CLS (.020), NEMA Test LD 3-1995.
4. High-pressure backer BKH (.048), (.039), (.028), NEMA Test LD3-1995.
5. Thermally fused melamine laminate, NEMA Test LD 3-1995.

D. Edging Materials:
1. 1mm PVC banding.
2. 3mm PVC banding, machine profiled to 1/8-inch radius.

2.3 CABINET HARDWARE:

A. Hinges:

1. Five knuckle, epoxy powder coated, institutional grade, 2-3/4-inch overlay type with hospital tip. 0.095 inch thick. ANSI-BHMA standard A156.9, Grade 1.

a. Doors 48 inches and over in height have 3 hinges per door.

b. Magnetic door catch with maximum 5 pound pull provided, attached with screws and slotted for adjustment.

B. Pulls:

1. Door and drawer front pulls are epoxy powder coated metal wire style, 96mm spacing on screws. Pull design shall comply with the Americans with Disability Act (ADA).

C. Drawer Slides:

1. Regular, kneespace and pencil: 100-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers. Positive stop both directions with self-closing feature. Paper storage, 150-pound load rated epoxy coated steel slides.

2. File: Full extension, 150-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers. Positive stop both directions with self-closing feature.

D. Adjustable Shelf Supports:

1. Injection molded transparent polycarbonate friction fit into cabinet end panels and vertical dividers, adjustable on 32mm centers. Each shelf support has 2 integral support pins, 5mm diameter, to interface pre-drilled holes, and to prevent accidental rotation of support. The support automatically adapts to 3/4 inch or 1-inch thick shelving and provides non-tip feature for shelving. Supports may be field fixed if desired. Structural load to 1200 pounds (300 pounds per support) without failure.

E. Master key all locks to one key with three (3) sub keys:

1. All doors and drawers to receive locks where shown on the drawings.

2. National #M49054, removable core, disc tumbler, cam style lock with strike. Furnish 1 key per lock. Lock for sliding 3/4-inch-thick doors is a disc type plunger lock, sliding door type with strike.

3. Automatic door bolt, Hafele #530-1604, used to secure inactive door on all locked cabinets.

F. Coat Rods: 1-inch diameter, 14-gauge chrome plated steel installed in captive mounting hardware.

G. File Suspension System: 14-gauge steel file suspension rails, epoxy powder coated. File followers, or other split bottom hardware, are not acceptable.

H. Rod Pockets: Mushroom type, machined from a solid aluminum rod. Sockets are held in place by a heavy aluminum lock nut and washer.

2.4 FABRICATION:

A. Fabricate casework, countertops and related products to dimensions, profiles, and details shown.

B. Cabinet Body Construction: Wall cabinets 14” deep. Base cabinets 24” deep, unless otherwise noted.

1. Tops and bottoms are glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals. Minimum 6 dowels each joint for 24-inch-deep cabinets and a minimum of 4 dowels each joint for 12-inch-deep cabinets.

a. Tops, bottoms and sides of all cabinets are particleboard core.

2. Cabinet backs: 1/4-inch-thick prefinished medium density particleboard. Wall and tall cabinets are provided with a 1-inch x 1-3/4-inch PVC mounting strip used to secure the cabinet to the wall.

a. Exposed backs 3/4” inch thick particleboard with the exterior surface finished in VGS laminate as selected.

3. Fixed base and tall units have an individual factory-applied base, constructed of 3/4-inch-thick exterior grade plywood. Base is 96mm (nominal 4 inch) high unless otherwise indicated on the drawings.

4. Base units, except sink base units: Full sub-top. Sink base units are provided with open top, a welded steel/epoxy painted sink rail full width at top front edge concealed behind face rail/doors, a split back removable access panel.

5. Side panels and vertical dividers shall receive adjustable shelf hardware at 32mm line boring centers. Mount door hinges, drawer slides and pull-out shelves in the line boring for consistent alignment.

6. Exposed and semi exposed edges.

a. Edging: 3mm PVC.

7. Adjustable shelf core: 3/4-inch-thick particleboard up to 30 inches wide, 1-inch thick particleboard over 30 inches wide.

a. Front edge: 1mm PVC.

8. Interior finish, units with open Interiors:

a. Top, bottom, sides, horizontal and vertical members, and adjustable shelving faces with thermally fused melamine laminate with matching prefinished back.

9. Interior finish, units with closed Interiors:

a. Top, bottom, sides, horizontal and vertical members, and adjustable shelving faces with thermally fused melamine laminate with matching prefinished back.

10. Exposed ends:

a. Faced with VGS high-pressure decorative laminate.

11. Wall unit bottom:

a. Faced with thermally fused melamine laminate.

12. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), not permitted.

C. Drawers:

1. Sides, back and sub front: Minimum 1/2-inch-thick particleboard, laminated with thermally fused melamine doweled and glued into sides. Top edge banded with 1mm PVC.

2. Drawer bottom: Minimum 1/2-inch-thick particleboard laminated with thermally fused melamine, screwed directly to the bottom edges of drawer box.

D. Door/Drawer Fronts:

1. Core: 3/4-inch-thick particleboard.

2. Provide double doors in opening in excess of 24 inches wide.

3. Faces:

a. Exterior: VGS High-pressure decorative laminate.
b. Interior: High-pressure cabinet liner CLS.

4. Door/drawer edges: 3mm PVC, external edges and outside corners machine profiled to 1/8-inch radius.

5. Miscellaneous Shelving:

a. Core material: 3/4 inch or 1-inch thick particleboard.
b. Exterior: VGS High-pressure decorative laminate.
c. Edges: 3mm PVC, external edges and outside corners machine profiled to 1/8-inch radius.

2.5 DECORATIVE LAMINATE COUNTERTOPS:

A. Core: 1-inch thick ANSI A 208.1-1993 M-2 particleboard, except at sink locations. Sink locations moisture resistant particleboard (M-3)

B. Surface: HGS/HGP high-pressure decorative laminate with balanced backer sheeting.

C. Edges, including applied backsplash: 3mm PVC, exposed edges and corners machine profiled to 1/8-inch radius. Edges are machine applied with moisture curing polyurethane (PUR) hotmelt for fast setting, high strength adhesion.

PART 3- EXECUTION:

3.1 INSPECTION:

A. The casework contractor must examine the job site and the conditions under which the work under this section is to be performed, and notify the building owner in writing of unsatisfactory conditions. Do not proceed with work under this Section until satisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 PREPARATION:

A. Condition casework to average prevailing humidity conditions in installation areas prior to installing.

3.3 INSTALLATION:

A. Erect casework, plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and cut to accurate fit.

B. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind.

C. Repair minor damage per plastic laminate manufacturer's recommendations. Replace other damaged cabinets or materials.

D. Cutouts in casework and tops for all plumbing, electrical and data connections shown on the Drawings shall be factory cut, no field cutting will be allowed. Plumbing, Electrical and data fixtures are provided by others. Coordinate any necessary repair.

3.4 CLEANING:

A. Leave cabinets broom clean inside and out. Wipe off fingerprints, pencil marks, and surface soil etc., in preparation for final cleaning by the building owner.

B. Remove and dispose of all packing materials and related construction debris.

3.5 COLOR SELECTION:

A. Laminate Color Selection: Select from the full range of Wilsonart®, Nevamar®, Pionite®, and Formica® colors.

END OF SECTION 12 30 40

SECTION 14 21 50
ELECTRIC GEARED TRACTION PASSENGER ELEVATORS

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections. apply to work of this Section.

1.2 DEFINITION:

A. An electric geared traction passenger elevator utilizes a hoisting machine consisting of a reduction gear with a high-speed motor to drive the traction sheaves.

1.3 SCOPE:

A. This Specification is intended to cover the complete renovation of the two existing elevators at the Guilford County Old Jail as shown on the Drawings and specified hereinafter.

B. The major elevator components shall be the products of one manufacturer of established reputation, except they may be the products, either wholly or in part, of another manufacturer of established reputation provided such items are engineered and produced under coordinated specifications. Any contractor who proposes to install any "major elevator component" not manufactured or normally assembled by him, as part of his equipment, shall have such product approved by the North Carolina Department of Labor, Elevator Division, prior to bidding this Specification. Also, the major components to be furnished shall be of a make or makes that have performed satisfactorily together under conditions of equal or greater capacity and speed for at least three years. Upon request, the names and addresses of the buildings and the names of the owners or managers thereof, in which the proposed combination of major components has so performed, shall be furnished.

1. The term "major elevator components" as mentioned above shall mean such items as the machine, hoisting motor, motor generator set, controllers, selector, door operator, and control equipment.

   The machine, motor generator set and associated control equipment shall be installed in the elevator machine room. Equipment shall be so arranged that parts can be removed for repairs or replacement by conventional means, without dismantling or removing other equipment components in the machine room. Sufficient workspace for maintenance and repair operations shall be provided around the elevator equipment in the machine room with clear passage to any access or trap doors.

1.4 GENERAL:

A. All work shall be performed in a first-quality manner and is to include all work and material in accordance with the Drawings and as specified herein.

B. In all cases where a device or part of the equipment is herein referred to as a single component. It is intended that such reference shall apply to as many such devices as are required to complete the installation.

C. All work shall be performed in accordance with the latest revised edition (as of the date bids are taken) of the American National Standard Safety Code for Elevators. Dumbwaiters, Escalators, and Moving Walks (ANSI A17.1), the National Electrical Code, and N. C. State Building Code.

D. Shop Drawings: The elevator contractor shall, prepare drawings showing the general arrangement and modifications to the existing elevator equipment. These drawings shall be approved by the Architect before proceeding with fabrication and installation of the elevators.

1. Drawings approved by the North Carolina Department of Labor, Elevator Division, are required before installation of the equipment.

2. Drawings shall show:

a. Modifications to / replacement of existing elevator equipment/systems, including elevator cabs, finishes, controls, fire access, cabling, etc.

b. Overall plans, elevations and sections for all floors served, travel distances and similar considerations of the work.

c. All new components provided shall be compatible with existing equipment.

E. Inspections: All tests required by regulations of the North Carolina Department of Labor shall be performed in the presence of authorized representatives from the North Carolina Department of Labor. Upon compliance with the applicable rules and regulations, a certificate of operation shall be furnished to the architectural engineer from the North Carolina Department of Labor.

F. Temporary Service: Should the service of any elevator be required before completion and final acceptance, permission in writing must first be obtained from the Architect. In addition, the user agrees to sign the elevator contractor's temporary acceptance form and be bound by the terms and conditions thereof.

1. The elevator shall be inspected and approved by the North Carolina Department of Labor, Elevator Division. before being allowed to operate on a temporary basis.

G. Storage: A dry and protected area, conveniently located to the elevator hoistway, shall be assigned to the elevator contractor without cost for storage of his material and tools.

1.5 BIDDER'S QUALIFICATIONS AND NOTIFICATION:

A. In the interest of unified responsibility, the elevator contractor shall be one regularly engaged in the business of installing and servicing elevators of the type and character required by these specifications.

1. The contractor shall have technical qualifications of at least three years of experience and trained supervisory and installation personnel to install specified items.

2 Any manufacturer's product submitted shall have been in satisfactory and efficient operation of three installations similar to this project for not less than three years. Contractor shall submit a list of installations, including names and addresses to the Architect for approval.

3. There shall be a permanent service organization maintained or trained by Contractor which will render satisfactory service to this installation within four hours of receipt of notification that service is needed. Submit name and address of service organization.

B. Coordination:

1. By submitting a bid the elevator subcontractor signifies that he has reviewed the Contract Drawings and has verified that his equipment will properly fit into the spaces shown on the Contract Drawings.

No extra pay or other compensation will be made to either the General Contractor or elevator subcontractor for modifications required during construction to either elevator equipment or spaces to receive elevator equipment.

1.6 APPROVED MANUFACTURERS:

A. Elevators that meet the requirements of the Drawings and these Specifications, by the following manufacturers will be acceptable for the Project when the specified submittals are approved in writing by the Architect.

1. Otis Elevator Company

2. Kone

3. Thyssen Krupp

4. Southern

B. All materials and equipment shall be new, of make and kind specified herein or as indicated on the Drawings, without exception.

C. For purposes of describing type and quality of products required, the Drawings and Specifications are based on equipment and materials of the manufacturer described hereinafter. If substitute equipment is proposed, submit for approval Drawings showing any changes required by this equipment or material and be responsible for its installation in the allotted space with proper clearances.

D. Where such approved substitution or deviation requires different quantity or arrangement of foundations. supports, wiring and any other equipment or accessories normal to this equipment, furnish said changes and additions and pay all costs for all changes to the work and the work of others affected by this substitution or deviation.

1.7 WARRANTY:

A. The elevator contractor shall guarantee the materials and workmanship against defect due to faulty materials, and/or workmanship, or negligence for a period of twelve (12) months following the final acceptance of the work. Where items of equipment or material carry a manufacturer's warranty for any period in excess of twelve (12) months, then the manufacturer's warranty shall apply for that particular piece of equipment or material. The contractor shall replace such defective materials, equipment, or workmanship without cost to the Owner within the stipulated guarantee period.

B. This warranty is not intended to supplant normal maintenance service and shall not be construed to mean that the elevator contractor will provide free service for periodic examination, lubrication, or adjustment due to normal use beyond that included in the specifications; nor will the elevator contractor correct, without charge, breakage maladjustments, or other trouble arising from abuse, misuses, or improper use of the equipment which may develop within twelve (12) months from the date of acceptance.

C. Maintenance Service: The elevator contractor shall furnish a first-quality maintenance and call-back service on each elevator after it is completed and placed in operation for a period of twelve (12) months, concurrent with warranty period. This service shall consist of examinations of the equipment at a minimum of once a month. Service shall include adjustments, lubrication, cleaning, supplies and parts to keep the equipment in proper operation, except for such adjustments, replacement of parts or repairs made necessary by abuse, misuse or any other causes beyond the control of the elevator contractor. All work will be done by trained employees of the elevator contractor during regular working hours of the trade. Emergency call-back service shall be provided and included for all hours and days during the maintenance period.

D. Examinations and Log: During the warranty maintenance period the elevator contractor shall maintain a log for each elevator. The log shall be located in the elevator machine room and be used to indicate all call backs, repairs, replacement of parts and adjustments performed by the mechanic. Each entry in the log must be signed by the mechanic who performs the work and be kept up-to-date at all times.

1.8 WORK TO BE PERFORMED BY OTHERS:

A. The following itemized list is not part of the elevator contractor's work. Proper performance of such work is to be completed by the general contractor or other contractors or subcontractors:

1. A properly framed and enclosed legal hoistway, including adequate guards and protection of hoistway during the erection period;

2. Access to the machine room and machinery space as required by the governing code or authority;

3. Machine room with adequate ventilation;

4. Temperature in machine room to be maintained between 60 degrees F and 90 degrees F. Consult elevator contractor to verify that the controls supplied will function properly within this temperature range. Some solid-state controls require a controlled atmosphere:

5. Light and convenience outlets in machine room with light switches located within 18" of lock jamb side of machine room door;

6. A fused main line disconnects switch or circuit breaker for each elevator per the National Electric Code with feeder or branch wiring to controller (see NFPA 70-620-51);

7. A separate, single phase, 120-volt, 15-amp power supply with fused disconnect switch and wiring to one controller or selector for elevator signal system;

8. A fused disconnect switch (SPST) 120-volt A/C, 20 amp, located adjacent to the main line disconnect switch for the elevator car light supply. Feeder wiring to be routed to the elevator controller;

9. Ventilation and/or pressurization of the hoistway as required by the governing code or authority;

10. Adequate supports for rail brackets including separator beams where required. Maximum bracket spacing as required by elevator contractor, but not to exceed 14'0" for car rails;

11. Front entrance partition walls to be constructed after door frames and sills are in place. If front walls are poured concrete bearing walls, rough openings are to be provided to accept entrance frames and filled in after frames are set;

12. Level surface of finished floor of each landing to be continuous for full width of hoistway. Adequate support or sill angle across full width of hoistway at each landing. Vertical surfaces of entrance sill support to be plumb, one above the other, and square with the hoistway. Grout (if required between door frames to sill line) to provide a smooth level surface;

13. Cutouts and patching as required, to accommodate hall signal fixtures, oil lines, conduit, etc.;

14. Dry pit reinforced to sustain vertical forces on car rails and impact loads from car buffers:

15. Convenience outlet and light fixture in pit with a switch located adjacent to the access door, 42" above floor;

16. Where access to the pit is by means of the lowest hoistway entrance, a vertical steel ladder extending 48". minimum, shall be located above sill of access door. When the pit depth exceeds 6'7", a work platform covering the entire area shall be installed.

17. Any cutting, patching and painting of walls, floors or partitions together with finish painting of entrance doors and frames;

18. Electric power for lights, tools, hoists, etc., during erection as well as electric current of permanent characteristics for installing, testing and adjusting the elevator;

19. Heat and smoke sensing devices at elevator lobbies on each floor with electric conductors terminating at a properly marked elevator control panel in the elevator machine room;

20. The elevator equipment is to be arranged for emergency power operation, an emergency power unit and means for starting it, delivered to the elevator disconnect switches in the machine room with sufficient power to operate the elevator(s) at full rated speed, as per North Carolina State Building Code, Section 506.10.

    a. An automatic transfer switch to switch from normal power to emergency power, and a contact on the transfer switch closed on normal power supply with two wires from this contact to one elevator controller; 10 to 20 second time delay signal to elevator controls, previous to return of the elevator to normal power:

21. Telephone instrument in each cab and telephone line wiring to each elevator controller required by code;

22. Public address speaker and communication equipment required by North Carolina State Building Code or Elevator Code.

23. All signs and graphics required by the North Carolina State Building Code, Section 506.

1.9 PASSENGER ELEVATOR:

A. Type shall be Electric Geared Traction.

B. Door operation shall be furnished with new closed loop door operators.

C. Car enclosure (elevator cars) shall conform to minimum requirements described in 14A1-08.

D. Characteristics listed below shall conform to indications in the Drawings:

1. Car travel shall extend from the lowest to the topmost floor for which hoistway openings are indicated in the floor plans.

   Stops shall be provided for all floors for which hoistway openings are indicated in the floor plans.

2. Openings, in line shall be provided for each hoistway opening indicated in the floor plans.

3. Machine Room apparatus shall be located in the room identified.

E. Other Characteristics: The following data listed shall be described completely in the specification.

1. Quantity of elevators.

2. Rated load(s).

3. Rated speeds, upward and downward travel under full load.

4. Hoistway door type(s).

5. Operation.

6. Signal and operating fixtures.

7. Power supply.

8. Ornamental design of car enclosure, with appurtenances and appointments.

9. Platform size (clear inside dimensions of car).

10. Protective pads and pad hooks.

11. Finish of hoistway entrance frames and doors.

F. Standard Features Shall Include:

1. Emergency fire service when required by the National Elevator Code, ANSI A17.1 and North Carolina State Building Code;

2. Flush mounted ADA compliant telephone (telephone to be furnished by Owner; telecommunication wiring provided by owner) connected to a twenty-four-hour switchboard;

3. Applied plates with raised numerals and symbols on car station and on hoistway entrances for handicapped;

4. Fully enclosed National Electrical Manufacturers Associations (NEMA) 1 control cabinet;

5. All special requirements for the handicapped as outlined by National Elevator Industry Incorporated and North Carolina State Building Code:

6. Emergency light in car;

7. Fan assembly in car. key operated switch located in car operating panel:

8. Mounting height of operating device buttons shall comply with the requirements of North Carolina State Building Code:

9. Leveling Tolerances: 1/2", up or down, regardless of load and direction of travel.

10. Car light switch. key operated, located in car operating panel:

11. Independent service switch, key operated, located in car operating panel:

12. Certificate of operation frame. tamper-proof design. located at or adjacent to the car-operating panel;

13. Car door(s) and front return(s) shall be stainless steel finish; and

14. Stainless steel handrail mounted on the rear wall of the elevator car.

15. Top of Car Handrail

16. Full cover guarding shall be installed on all exposed rotating equipment.

G. Buildings classed as "high-rise" according to the N. C. State Building Code, Section 506.

1. Meet primary emergency elevator requirements.

2. Meet sequential and selective operation.

3. Provide car position indicator for each elevator.

4. Provide wiring from cab to controller to meet communication requirements. 1.10

PART 2: PRODUCTS

2.0 CAR DOORS AND INTERIORS:

A. CAR INTERIOR: Finish materials provided on walls, ceilings and floors of cars shall comply with the NC State Building Code Section 506.8 which requires a Class A flame spread rating and smoke developed classification of not more than 100 when tested in accordance with ASTM E 84.

1. Car walls finish: Plastic Laminate panels walls (Laminate to be selected from Manufacture’s standard colors)

2. Car ceiling finish: Six panel stainless steel ceiling panels with six LED recessed lights.

3. Stainless Steel hooks and vinyl protective pads at the sides and rear of car enclosure.

B. CAR DOORS (Stainless steel finish):

1. The car entrance shall be retained and provided with horizontal sliding doors. Panel rigidity shall be obtained by suitable steel reinforcements. Doors shall be

hung on new hangers with non-metallic tires and sheaves running on a new polished steel track and guided at the bottom by non-metallic shoes.

C. CAR FLOORING:

1. Ceramic tile flooring (3/8" thick) will be added within the elevator to match ceramic tile in Lobby 101.

2.1 GUIDE RAILS, ROLLER GUIDES, COUNTERWEIGHTS& SAFETIES:

A. Guide Rails: Rails will be retained in its current state.

B. Roller Guides: New roller guides shall be mounted on top and bottom of the car frame to engage the guide rails. Each roller shall be individually adjustable to control rail to rail movement. Rollers shall be capable of being individually renewed.

C. Counterweights: A structural steel frame with individual cast iron or steel plate filler weights shall be furnished to provide proper counterbalance. The counterweight shall be equal to the complete elevator car and approximately 40% of the specific load. A metal counterweight guard shall be furnished and installed at the bottom of the hoistway.

D. Safeties: New safeties shall be furnished to replace the wind-up safeties on the bottom of the elevator car.

2.2 MACHINE, MOTOR AND BRAKE:

A. The current machine shall be retained, and new full cover machine guarding shall be installed.

B. The motor is to be of the alternating current type, designed to develop the required high starting torque with a low starting current. The motor shall be suited in all respects to the generator field control used. The motor shall be ruggedly designed and all parts shall be capable of meeting the severe requirements of elevator service.

C. The electric brake shall be spring applied. It shall be held open by an electromagnet actuated by the controller and designed to make smooth, positive stops. It shall be designed to automatically apply in the event of interruption of power supply from any cause. The electric brake shall mechanically set each time the elevator stops. A new brake switch and brake lining shall be furnished.

2.3 CONTROLLER:

A. Microprocessor Control System: Provide manufacturer's standard solid-state microprocessor-based control system for each elevator or group of elevators as required to provide automatic or group automatic operation.

1. Microprocessor based control system shall perform the functions of safe elevator motion, car operational supervisory control and elevator door control. System shall allow for reprogramming of software to suit the individual requirements of each group of elevators, and changing operational requirements of the facility, based upon the parameters of the operational system(s) specified.

2. The system shall include the hardware required to connect, transfer and interrupt power, and protect the motor against overloading; and perform car operation control.

3. Each controller cabinet containing memory equipment shall be properly shielded; controls shall accept reprogramming with minimum system down time, and shall not lose its memory from power failure.

4. Equipment Enclosures: Install control system in cabinets of steel with hinged doors or panels arranged for easy removal, of required gage and properly grounded as required by National Electric Code. Rack mount equipment to permit easy access to components. Provide doors with recessed ring-pulls or handles and ventilation grills at top and bottom.

2.4 WIRING:

A. All wiring and electrical interconnections shall comply with governing codes. Insulated wiring shall have flame retardant and moisture proof outer covering, and shall be run in conduit, tubing or electrical wireways. Traveling cable shall be flexible and suspended to relieve strain on individual conductors. Each traveling cable shall have spare conductors, in a number not less than 10 percent of the active conductors. A shielded pair of 18 gauge wires shall be provided between each elevator cab telephone cabinet and the elevator machine room. The wiring in the elevator machine room shall terminate on a terminal in the controller.

2.5 AC VARIABLE FREQUENCY - AC DRIVE:

A. A new regenerative alternating current drive shall be provided.

2.6 ROPES:

A. The current hoist ropes shall be retained.

B. The current governor rope shall be retained.

2.7 SPEED GOVERNOR:

A. The current speed governor shall be retained.

B. A new governor guard shall be furnished.

2.8 AUTOMATIC TERMINAL LIMITS:

A. Electric limit switches shall be placed in the hoistway near the terminal landings and be designed to cut off the electric current and stop the car should it run beyond either terminal landing.

2.9 AUTOMATIC SELF-LEVELING:

A. The elevator shall be provided with a self-leveling feature that will automatically bring the car to the floor landing. The self-leveling shall, within its zone, be entirely automatic and independent of the operating device and shall correct for overtravel or undertravel. The car shall also be maintained within the specified 1/2" leveling tolerance with the landing regardless of the load.

2.10 BUFFERS:

A. The current buffers shall be retained.

2.12 CAR TOP INSPECTION STATION:

A. A car top inspection station shall be located on each car top.

B. The activation of the "car top inspection station" shall make the normal operating devices inoperative and give the inspector complete control of the elevator.

C. Proper lighting shall be provided adjacent to the car top inspection station.

2.13 DOOR OPERATION:

A. Closed Loop Door Operator is a closed loop, microprocessor-based door operator system. The door operator will facilitate smooth operation under varying environmental influences such as, temperature, wind, friction, and component variation. The processor will monitor the door's actual position and velocity compared to its desired position and velocity. If variations are detected in the profile the command will be automatically corrected. A new closed loop door operator shall be furnished.

2.14 INTERLOCKS:

A. Each hoistway entrance shall be equipped with a new approved type interlock tested as required by ANSI A17.1 Code. The new interlock shall be designed to prevent operation of the car away from the landing until the doors are locked in the closed position as defined by Code and shall prevent opening the doors at any landing from the corridor side unless the car is at rest at that landing or is in the leveling zone and stopping at that landing.

2.15 HOISTWAY DOOR UNLOCKING DEVICE:

A. Hoistway door unlocking devices as specified by the ANSI A17.1 Code shall be provided at each landing to permit authorized persons to gain access to hoistway when elevator car is away from the landing.

2.16 DOOR HANGERS AND TRACKS: Complete new door hangers and new tracks shall be provided for each car and entrance doors.

A. Hangers shall be sheave-type, arranged for two-point suspension.

1. Sheaves shall be steel with a flanged groove into which a solid non-metallic tire shall be vulcanized securely. Sheaves shall be a minimum 2 1/2" diameter.

2. Bearings for sheaves and rollers shall be ball type, sealed to retain grease lubrication.

3. Hanger brackets shall be the applied type. Steel housing shall be provided for attachment to the door.

4. Rollers, with ball-bearings, shall be provided to remove excessive door up-thrust.

B. Tracks shall be steel. (Adjustable and applied type)

1. Entrance door track shall be cold-rolled, smooth surface.

2. Car door track shall be cold-rolled, with surfaces shaped to conform to the tread of the hanger sheaves and rollers.

C. Special approval must be given by the North Carolina Department of Labor, Elevator Division, before integral type hangers and tracks can be used.

2.17 HOISTWAY ENTRANCES:

A. The current frame shall be retained for each car. Current frames are to be refinished and painted.

B. New hoistway doors shall be installed for each car.

2.18 CAR DOORS

A. New car doors shall be installed for each elevator in stainless steel #4.

B. New restrictors shall be installed for each car.

2.19 OPERATION:

A. Two-car selective collective automatic operation: Control of the elevator shall be automatic in operation by means of pushbuttons in the car numbered to correspond to floors served, for registering car stops and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings. The momentary pressing of one or more buttons shall dispatch the car to the designated landings in the order in which the landings are reached by the car, regardless of the sequence in which the buttons are pressed. Each landing call shall be cancelled when answered. When the car is traveling in the up direction, it shall stop at all floors for which car buttons or "up" hall buttons have been pressed: it shall not stop at floors where "down" buttons only have been pressed, unless the stop for that floor has been registered by a car button, or unless the down call is at the highest floor for which any buttons have been pressed. Likewise, the pressing of an "up" button when the car is traveling in the down direction shall not intercept the travel unless the stop for that floor has been registered by a car button, or unless the up call is the lowest for which any button has been pressed.

B. When the car has responded to its highest or lowest stop, and stops are registered for the opposite direction, its travel shall reverse automatically, and it shall then clear the calls registered for that direction.

C. Should both up and down calls be registered at an intermediate floor, only the call corresponding to the direction in which the car is traveling shall be cancelled upon the stopping of the car at the landing. The control shall be arranged so that normally one car shall be parked at the main floor, and the other, a free car, shall answer the landing calls. Should both cars happen to finish their calls at the main floor, the car which arrived first shall become the free car to answer subsequent landing calls. An idle free car shall answer any landing call either above or below where it may be standing except main floor calls and basement landing calls if a basement is served. When the free car is clearing calls, the other car parked at the main floor shall automatically start to answer landing calls under the following conditions: Should an up call be registered from a landing below the free car when it is traveling up; or, should an up or down call be registered from a landing above the free car when it is traveling down: or, inability of the free car to move in response to registered landing calls within approximately 40 seconds. Either car shall always respond to its own car buttons regardless of the direction of the landing calls. When either car is taken out of service for any reason, the other car shall automatically answer all calls from the landings and its own car buttons.

D. The operating buttons in the car and at the landings shall be mounted in flush plates or swing return panel of a stainless-steel finish. The car panel shall contain an emergency stop switch to interrupt the power supply independently of the regular operating device. The opening of the stop switch shall not cancel the registered calls and after this switch is again closed, the car shall continue to answer its various calls. The car panel shall also contain a key-operated car light switch and a fan switch. The buttons in the car and hall stations shall be of the light-up type which will be illuminated when the button is pressed indicating that a call has been registered for that landing.

E. Independent Service: A key-operated switch shall be provided for each elevator for selecting independent service operation. When this switch is in the independent service position, the elevator shall be disconnected from the duplex control system and all hall calls will be transferred to the other car. The elevator taken out of service may then be run from its car buttons for any special usage.

F. Load Weighing Device: Each car shall be provided with a load weighing device which, when the particular car is filled to an adjustable percentage of the capacity load, shall cause the car to by-pass the landing calls but not car calls. These passed landing calls shall remain registered for the next following car. The device shall be unaffected by the action of compensating chain or rope.

G. Additional features of operation.

2.20 HALL FIXTURES/CONTROL OPERATING PANEL

A. New surface mounted stainless steel vandal resistant button shall be installed on each landing.

B. A new control operating panel shall be installed with new stainless steel vandal resistant buttons in accordance with ASME.

2.21 CAR POSITION INDICATOR:

A. A digital position indicator shall be provided in the upper portion of the elevator cab. An audible signal shall sound prior to elevator arriving at or passing any landing.

2.22.1 CAR RIDING DIRECTION LANTERN WITH GONG:

A. A new in car lantern will be installed.

B. If hall lanterns are installed, the car-riding lantern with gong will not be required.

C. Hall Lanterns (optional): Hall lanterns with an audible signal shall be provided over or adjacent to all hoistway entrances with single lantern at terminal floors and "up" and "down" lanterns at intermediate floors. As soon as the car has reached a predetermined distance from a floor and is set to stop at that floor, the corresponding hall lantern shall be illuminated and the signal shall sound whether the hall button has been pressed or not, and the lantern shall remain illuminated until the car has left that landing. Lanterns shall comply with handicapped code requirements as outlined in North Carolina State Building Code (11x)4.9.

2.23 PASSENGER SENSING DEVICE:

A. An electronic full entrance detector designed to operate as described below shall be provided at the entrance of the elevator car.

B. After a stop is made, the doors shall remain open for an adjustable time interval. Closing may be initiated instantaneously by registration of a car call.

C. The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door movement is obstructed for a predetermined time, the electronic door reversal device shall be inhibited, and the doors shall close at a reduced speed and torque, in accordance with ASME A 17.1 code requirements. Closing shall be initiated one-half second after the passenger or object has moved from the opening.

2.24 HOISTWAY AND PIT EQUIPMENT

A. A new pit ladder shall be installed in the pit of each elevator.

B. One pit switch shall be installed in the hoistway of each elevator.

C. Counterweight guards shall be installed in the pit of each elevator.

D. A new alert system shall be installed in the pit and on the car top of each elevator. This alert system will create an alarm when the elevator doors are opened manually to access the hoistway. The alarm will continue to sound until the stop button is engaged.

2.25 COMPLETION:

A. Upon completion, the elevator shall be in complete working order and free from all defects.

B. The elevator contractor shall provide two complete sets of electrical and solid-state wiring diagrams. and operating and maintenance manuals. These shall include:

1. Description of the elevator system's sequence of operation and control including the functions of signals, door devices and other features;

2. Written instructions for the trouble-shooting, adjustment and care of the entire equipment;

3. Electrical prints shall be reproducible type, non-fading;

4. One set shall be sealed in a clear material and mounted in the elevator machine room;

5. All electrical wiring diagrams shall be "as built" drawings. If standard drawings are used they shall be marked up according to the installation for which they apply;

6. The identification label for each diagram and manual shall include the subject, building name, location, contract number, and the specified state assigned elevator number to which the diagrams and manuals apply;

7. One set of diagrams and manuals shall be delivered to the Architect who will deliver them to the engineering officer of the facility; and

8. The elevator contractor shall notify the North Carolina Department of Labor for scheduling of a final inspection as per code and specifications. Approval must be given that all code requirements have been met and that installation complies with the specifications before final payment will be made.

END OF SECTION 14 21 50

SECTION 21 00 00 - FIRE PROTECTION SYSTEM

1 PART 1 - GENERAL:

A. This work shall consist of furnishing all labor, material, equipment, and services necessary for the complete installation and operation of the automatic sprinkler system as indicated on the drawings, as specified herein, and as required.

B. The Contractor is responsible for all calculations, submittals to all governing agencies, and piping (sizes and routing) required for full compliance with NFPA 13 and 14, Class I System and the AHJ. Building will require wet, dry, standpipe, elevator shaft, fire pump, fireman control room, FDC, PIV, etc. systems.

C. Equipment and components principally relevant to this section includes:

Pipe, fittings, valves, and specialties.

D. The contractor shall furnish and install the disconnect/controllers related to this work. Fire protection contractor shall provide load side wiring into the equipment. Consult Division 26 for additional requirements.

E. The building is classified "HIGH RISE". Contractor shall follow all NFPA, State, and Local requirements for a High Rise Building and Fireman Control Room.

F. Clearances (floor to structure height) are EXREMELY LIMITED! Contractor must design piping layout to comply with ALL other trades. Required sloped plumbing piping shall have first priority. Ductwork shall have second priority. Contractors MUST provide ¼" scale coordination drawings to demonstrate maximum height clearances have been achieved.

1.1 Related Documents:

This project will be Seismic Design Category "C". Consult Structural Drawings bound in this bid set (and the addenda) to confirm no changes in seismic design category- alter to match as necessary.

If the classification results in a SD Category "C" or "D": Provide documentation showing required seismic restraints and calculations. Provided sealed letter from a licensed NC engineer that the restraints have been inspected and the installation is code compliant.

Drawings and General Provisions of Contract, including the Notice to Bidders, Instructions to Bidders, General Conditions of the Contract, Supplementary General Conditions, and all applicable specification sections of Division 1 - General Requirements shall apply to this section.

1.2 Related Sections: The following sections contain requirements that relate to this section.

In Section 23 05 10 - Firestopping for materials and methods for sealing pipe penetrations through walls and fire/smoke barriers.

Section 23 05 29 - Hangers & Supports for specifications that apply to all mechanical trades.

1.3 Coordination/Phasing/Punch List Consideration:

NC FPC 901.7 mandates that where a required fire protection system is out of service, the fire department, and the fire code official shall be notified immediately. As required by the fire code official, an approved fire watch shall be provided for all occupants left unprotected by the shut down until the fire protection system has been returned to service. **NOTE: The tunnel system shall remain in use by the Prison System. Coordinate and verify service is not interrupted.**

A. A meeting of all trades shall be required for each area of the building to identify proposed routings and options. A schedule to produce coordination drawings for each area must be agreed upon and signed off- provide schedule to the Design Team.

B. The FPC shall then produce sprinkler coordination drawings (while having regular conversations and meetings with all other trades) with all piping and equipment. The drawings shall be to scale, dimensioned and clearly identified. The drawings shall indicate bottom of pipe for all equipment. Upon completion, forward to the Mechanical Contractor (MC) for incorporation into the overall coordination drawings. Adjust drawings as necessary during the coordination process.

C. The final overall coordination drawings/model must be completed prior to any plumbing, fire protection, mechanical and electrical work starting on the job.

D. The FPC is responsible for purchasing his final overall coordination drawings from the printer.

1.4 Calculation Consideration:

NC Administrative Code SEC 204.3.5 &6 requires that installation drawings shall be prepared under the supervision of Professional Engineer (PE) registered in North Carolina or a Level III technician certified in Fire Protection Engineering Technology and Automatic Sprinkler System Layout issued by the National Institute for Certifications in Engineering Technologies (NICET). Submittals, drawings, and hydraulic calculations shall bear the PE or NICET certification number.

1.5 Definitions:

A. Pipe sizes used in this specification are Nominal Pipe Size (NPS).

B. Other definitions for fire protection systems are listed in NFPA Standards 13, 14, 20, and 24.

C. Working plans and hydraulic calculation forms as used in this section means those documents prepared pursuant to the requirements contained in Chapter 8 of NFPA 13 for obtaining approval of the Architect/Engineer, the local Fire Marshal, and as used by the contractor for fabrication of his work. The sprinkler contractor shall be responsible for obtaining an accurate flow test to use as the basis for final hydraulic calculations. The information listed on the drawings was provided by others as indicated.

1.6 System Description:

The building fire protection system shall be an automatic sprinkler system.

1.7 Submittals:

Submit for Architect/Engineers' review, six (6) copies (unless noted otherwise) of the following:

1.8 Product data shall be submitted in one package and shall include the following:

Piping (including fittings, pipe hangers, and supports).
Valves.
Alarm devices.
Heads
All other system accessories (i.e. ball drips, inspector's test, pressure gauges, etc.).
Fire Dept. Connection.

1.9 "Shop drawings" shall be prepared by the Contractor and in accordance with NFPA 13 Chapter 8 identified as "Working Plans", and "Hydraulic Calculations" and shall have an approval letter from the local Fire Marshal before being submitted to architect/engineer for review. The shop drawings shall be prepared following the general location and arrangement of the piping system shown on the contract drawings. The Contractor is responsible for all shop drawing and field coordination with all other trades. Shop drawing coordination with other trades shall be incorporated into the sprinkler shop drawings. Submit a minimum of six (6) sets of working plans and two sets of hydraulic calculations (Hydraulic calculations will not be stamped or returned). Coordinate with Fire Marshal for exact location of Fire Dept. Connection prior to submittal- conform at no additional cost to Owner. FDC must be within 100' of a fire hydrant.

1.10 Record Drawing: The Contractor shall provide one set of mylar reproducible "Record Drawings" which include all field variances along with an updated Autocad file (Release 2018 Minimum). A record set of hydraulic calculations that include any modification shall be included with the record drawings. ALSO provide a .PDF of all "as-built" drawings and calculations.

1.11 Maintenance data for each type sprinkler head, valve, piping specialty, fire protection specialty, for inclusion in operating and maintenance manual specified in Section 230500 - General Mechanical. Four (4) copies required.

1.12 Welder's Qualification certificate.

1.13 Test reports and certificate The fire sprinkler contractor should have for review all pertinent NFPA paperwork properly filled out on NFPA forms as applicable (NFPA 13, 14, 20, 24). A set of as-built fire sprinkler shop drawings and hydraulic calculations shall be placed in a white PVC tube marked 'Fire Sprinkler Shop Drawings' and securely fixed in the fire sprinkler riser room. A second set of 'as built' shop drawings should be provided to the owner. The test data and flows shall be provided on a tag permanently attached to the riser.

1.14 Quality Assurance:

1.15 Regulatory Requirements: The design and installation of the fire protection system shall comply with the requirements of the following codes:

The North Carolina State Building Code

Local Fire Marshal

NFPA Standards 13, 14, 20, 24, 72, 72-E, and 101.
NFPA14-20xx (latest adopted version by the State) Standard for Installation of Standpipe and Hose System.

N.C. Department of Insurance Requirements for Automatic Sprinkler Systems, latest revision.

Insurance Underwriters: Owner's Insurance Company.

UL and FM Compliance: Fire protection system materials and components shall be Underwriters' Laboratories listed and labeled and Factory Mutual approved for the application anticipated.

1.16 Applicable Publications:

The standards listed below form a part of this specification to the extent referenced. The standards are referenced in the text by the basic designation.

American National Standards Institute (ANSI):

B1.20.1 Pipe Threads
B16.1 Cast-Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
B16.3 Malleable Iron Fittings, Class 150 and 300.
B16.4 Cast-Iron Threaded Fittings, 125 and 250.

B16.22 Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
B16.24 Bronze Pipe Flanges and Flanged Fittings, Class 150 and 300.

American Society for Testing and Materials (ASTM):

A 47-84	Specifications for Ferritic Malleable Iron Castings.
A 120-84	Specifications for Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses.
A 126-84	Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
A 234-85	Specifications for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
B 32-83	Specification for Solder Metal.
B 88-83a	Specifications for Seamless Copper Water Tube.

American Welding Society (AWS):

A5.8-81	Specifications for Brazing Filler Metal (An American National Standard)
D10.9-80	Specification for Qualifications of Welding Procedures and Welders for Piping and Tubing.

Manufacturer Standardization Society of the Valve and Fittings Industry, Inc. (MSS):

SP71-84	Cast-Iron Swing Check Valves, Flanged and Threaded Ends

National Fire Protection Association (NFPA):

13-2007	Standard for the Installation of Sprinkler Systems.
72-1990	Standard for the Installation, Maintenance, and Use of Protective Signaling Systems.
72E-1990	Standard on Automatic Fire Detectors.
101-2000	Safety to Life from Fire in Buildings and Structures

PART 2 - PRODUCTS

2 Manufacturers:

Subject to compliance with requirements, provide Fire Protection System products from one of the following:

Pipe & Fittings:

Per FM Approval Guide

Backflow Preventer Valves:

Ames
Hersey
Mueller
Watts

Butterfly Valves:

Central
Grinnell
Milwaukee Valve Co. Inc.
Mueller
NIBCO, Inc.

Gate Valves (OS&Y):

American Darling
Central
Clow
Crane
Grinnell
Jenkins
Kennedy Valve, Div. of ITT Grinnell Valve Co., Inc.
Nibco, Inc.
Mueller
Stockham
United Brass Works, Inc.

Swing Check Valves:

Central
Jenkins
Kennedy Valve, Div. of ITT Grinnell Valve Co., Inc.
Mueller
Nibco, Inc.
Reliable
Star Sprinkler Corp.
Stockham

Wafer Check Valves:

Central
Clow
Kennedy Valve, Div. of ITT Grinnell Valve Co. Inc.
Mueller
Nibco, Inc.
Star Sprinkler Corp.

Stockham
United Brass Work, Inc.

Grooved Mechanical Couplings:

Grinnell
Gustin-Bacon
Stockham
Victaulic Company of America

Water Flow Indicators:

Federal Signal Corp.
McDonnell & Miller
Notifier
Potter Electric Signal Co.

Water-Motor Gongs:

Automatic Sprinkler of America
Central
Reliable Automatic Sprinkler Co., Inc.
Star Sprinkler Corp.
Viking Corp.

Supervisory Switches:

Grinnell Fire Protection Co., Inc.
Notifier Company
Potter Electric Signal Co.

Alarm Check Valve:

Automatic Sprinkler Corp. of America
Central Sprinkler Corp.
Gem Sprinkler Co.
Reliable Automatic Sprinkler Co., Inc.
Star Sprinkler Corp.
Viking Corp.

Sprinkler Heads:

Automatic Sprinkler Corp. of America
Central Sprinkler Corp.
Gem Sprinkler Co.
Reliable Automatic Sprinkler Co., Inc.
Star Sprinkler Corp.
Viking Corp.

2.1 Hose Outlet Valves: 300 psig, 2-1/2", bright chrome plated where in cabinets, rough brass finish in closets or service stairs, adjustable pressure restricting brass angle valve, with matching removable cap and chain. Valve factory set and capable of overriding in field for full flow.

2.2 Pipe and Pipe Fittings:

2.3 General: Refer to the Execution section, Article "Pipe Applications" for identification of systems where the below specified pipe and fitting materials are used. Pipe shall be new, designed to withstand the working pressures involved, but not less that 175 psi. Pipe shall have the manufacturer's name or brands, along with the applicable ASTM standard, marked on each length of pipe.

2.4 Black steel pipe shall be Schedule 40 or Schedule 10 in accordance with ASTM A53, A120, A135 or A795. Pipe shall have a resistance index greater than one (1).

2.5 NFPA 13.8.4.7.2 .4.7.2.1 where steel pipe is used in dry pipe systems, piping materials shall be limited to internally galvanized steel.

2.6 Hot dipped zinc coated (galvanized) pipe shall be Schedule 40 in accordance with ASTM A53, A120, A135 or A795. Pipe shall have a resistance index greater than one (1).

2.7 Cast-iron threaded fittings shall be ANSI B16.4, Class 125, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

2.8 Malleable-iron threaded fittings shall be ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

2.9 Grooved mechanical fittings shall be ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47 Grade 32510 malleable iron; or ASTM A53, Type F or Types E or S, Grade B fabricated steel fittings with grooves or shoulders designed to accept grooved end couplings.

2.10 Grooved mechanical couplings shall consist of ductile or malleable iron; housing, a synthetic rubber gasket or a central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or logs to secure roll-grooved pipe and fittings. Grooved mechanical couplings including gaskets used on dry-pipe systems shall be listed for dry-pipe service.

2.11 Cast iron threaded flanges shall be ANSI B16.1, Class 150; raised ground face, bolt holes spot faced.

2.12 Welding materials shall comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.

2.13 Gasket materials: Thickness, material, and type suitable for fluid or gas to be handled, and design temperatures and pressures. Per NFPA 13 all fittings used in dry pipe system shall be listed for use in dry pipe systems.

2.14 Pipe hangers and supports shall be as specified in Chapter 6 of NFPA 13. All hanger assemblies (ring and rod) shall be all pre-galvanized.

2.15 General Duty Valves:

Butterfly Valves - 2 1/2 through 8 inch: "Slow-close" type used to control waterflow in fire protection systems. Valve position indicator and with built-in supervisory switch. UL listed and FM approved. 175 psi working pressure/300 psi test pressure.

Gate Valves - 2 Inch and Smaller: Body and bonnet of cast bronze, 175-pound cold water working pressure - non-shock, threaded ends, solid wedge, outside screw and yoke, rising stem, screw-in bonnet, and malleable iron handwheel. Valves shall be capable of being repacked under pressure, with valve wide open.

Gate Valves - 2-1/2 Inch and Larger: Iron body; bronze mounted, 175-pound cold water working pressure - non-shock. Valves shall have solid taper wedge; outside screw and yoke, rising stem; flanged bonnet, with body and bonnet conforming to ASTM A 126 Class B; replaceable bronze wedge facing rings; flanged ends; and a packing assembly consisting of a cast iron gland flange, brass gland, packing, bonnet, and bronze bonnet bushing. Valves shall be capable of being repacked under pressure, with valve wide open.

Swing Check Valves: MSS SP-71; Class 175, cast iron body and bolted cap conforming to ASTM A 126, Class B; horizontal swing, with a bronze disc or cast iron disc with bronze disc ring, and flanged ends. Valve shall be capable of being refitted while the valve remains in the line.

2.16 Specialty Valves:

Alarm Check Valves: Replace existing with Variable pressure type, 175 psig working pressure, designed for horizontal or vertical installations, and have cast iron body with flanged inlet and outlet, bronze grooved seat with "O" ring seals, single hinge pin and latch design. Provide trim sets for bypass, drain, electric sprinkler alarm switch, pressure gauges, precision retarding chamber, drip cup assembly piped with check valve to main drain line, and fill line attachment with strainer.

Valves shall be approved by local Fire Marshal.

Dry Pipe Valve: U.L. listed latching differential type with associated trim package for system operation, maintenance, and testing. Provide protection against accumulation of water above the clapper by an automatic draining device. Provide accelerator(s) as required to provide discharge time required by local AHJ.

Air Compressor: Automatically maintained pressure system capable of restoring normal air pressure in the system within 30 minutes. Provide domestically manufactured assembly. Air compressor shall be single stage for motors below 1-1/2 hp and two stage for 1-1/2 hp and above, capable of producing air at 150 psi. Sixty gallon tanks and larger shall be ASME stamped. Pumps shall be cast iron with metal belt guard, intake air filter, pressure switch control, tank gauge, check valve, tank drain, pressure relief valve and outlet valve. Motor speed shall not exceed 1200 rpm. Magnetic starters and overloads shall be provided for all three phase motors.

2.17 Automatic Sprinklers:

Sprinkler heads shall be glass bulb type (concealed sprinkler style) and dry-pendent sprinkler may be fusible link type, and style as indicated or required by the application. Unless otherwise indicated, provide heads with nominal 1/2 inch or 17/32” discharge orifice, having temperature ratings suitable for the installation. Sprinkler heads in rooms containing a shower or similar high moisture content shall have a corrosion resistant coating.

Extended coverage sprinkler heads are acceptable as allowed by Code and the AHJ.

Sprinkler head styles and finishes shall be as indicated on drawings and as follows:

Recessed Pendent, Upright, and Sidewall Styles: Bright chrome semi-recessed type in finish spaces, exposed to view; (except where "concealed" style is indicated on drawings) rough bronze finish for heads in unfinished spaces and not exposed to view. Heads shall be wax-coated where installed exposed to acids, chemicals, or other corrosive fumes.

NOTE:

- All heads in ceilings serving the main level (where ceiling/structure height permit) shall have a fully concealed heads.

- All heads in finished spaces with ceilings (where ceiling/structure are limited) shall be semi-recessed type.
- All heads in architecturally sensitive areas (as noted on plans and areas such as Entry Lobbies, etc.) shall be fully concealed.
- Areas such as gyms or multipurpose rooms with ceilings shall have fully concealed heads to aid in protection against damage. IF a rare instance exists where the head cannot be fully concealed, provide welded steel wire guard to match.
- All heads in exposed structure areas shall be upright – verify with architect if chrome or white heads are preferred in each area.

Sprinkler escutcheons shall be all metal type with finish to match sprinkler.

Sprinkler guards shall be of welded steel wire, two piece design for installation on upright, pendent, or sidewall sprinklers with 1/2 inch pipe threads. Provide in all areas subject to damage. Guards shall have a red factory painted finish except in exposed areas where they shall match the head. All mechanical rooms shall have guards installed.

Sprinkler Head Cabinet and Wrench: Red enamel finished steel cabinet, suitable for wall mounting, with hinged cover and space for required number of sprinklers plus two sprinkler head wrenches. Provide at least one cabinet for each style sprinkler head on the project and as required by NFPA 13. Cabinet shall be labeled with white one inch high stencil lettering.

Connections:

General: All connections for the fire department shall have threads conforming to the local standards.

Alarm Devices:

General: Types and sizes shall mate and match piping and equipment connections.

Water Flow Indicators: Vane type waterflow detector, rated to 250 psig; designed for horizontal or vertical installation; have 2-SPDT circuit switches to provide isolated alarm and auxiliary contacts, 7 ampere 125 volts AC and 0.25 ampere 24 volts DC; complete with factory-set, field-adjustable retard element to prevent false signals, and tamper proof cover which sends a signal when cover is removed.

Water-Motor Gongs: 10 inch diameter cast aluminum gong, with factory-finish in red enamel; Pelton Wheel type operator with nylon shaft bearings, and shaft length and sleeve to suit wall thickness and construction; 3/4 inch inlet and 1 inch drain.
Provide with guard cover. Note: Electric alarm bell is an acceptable alternative provided it is coordinated with the EC at no additional cost to the Owner.

Supervisory Switches: SPST, normally closed contacts, designed to signal valve in other than full open position.

Piping Installations: Indicate location of fire hose valve cabinets on drawings.

Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. All exposed piping must be concealed from view as much as practical- utilize sidewall pendants when possible to minimize exposed piping. Submit layout for prior approval. Fire Marshal requirements shall be complied with at no additional cost to the Owner.

Work shall start at pipe flange approximately one foot inside of building (coordinate with G.C. prior to bidding).

Backflow Preventer: The Reduced Pressure Detector Assembly shall be installed inside the building by the fire protection contractor. Refer to plans for model and location. Backflow preventer shall be equal to Watts 909RPDA-OSY. Provide with air gap fitting and route drain to nearest floor drain.

Install sprinkler piping to provide for system drainage in accordance with NFPA 13. Coordinate all drain locations with architect and receive approval before starting construction.

Use approved fittings to make all changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

Install unions in pipes 2 inch and smaller, adjacent to each valve. Unions are not required on flanged devices or in piping installations using grooved mechanical couplings.

Install flanges or flange adaptors on valves, apparatus, and equipment having 2-1/2 inch and larger connections.

Grooved Mechanical Couplings shall be "zero-flex type where installed on exposed piping.

Hangers and Supports: Comply with the requirements of NFPA 13 and NFPA 14. Hanger and support spacing and locations for piping joined with grooved mechanical couplings shall be in accordance with the grooved mechanical coupling manufacturer's written instructions, for rigid systems.

Make connections between underground and above-ground piping using an approved transition piece strapped or fastened to prevent separation.

Install mechanical sleeve seal at pipe penetrations in basement and foundation walls.

Install test connections sized and located in accordance with NFPA 13 complete with shutoff valve. Test connections may also serve as drain pipes.

Install pressure gage on the riser. Provide gage with a connection not less than 1/4 inch and having a soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and where they will not be subject to freezing.

Install tamper switches on each sprinkler control valve and connect to building fire alarm system.

Install water-flow alarm switches in sprinkler piping where shown or noted or required to identify water flow.

Install all drains in concealed locations- coordinate with architect for prior approval.

Install Fire Department Connection (FDC) on side of building or at the detector check vault- coordinate exact location with local fire marshal- install as per their requirement as no additional cost to the owner- hydrant must be within 100’ of FDC.

Install Fire Hose Valve (cabinets) at mounting height dictated by local fire marshal. Prepare recesses in walls – do not disturb any wall ratings. Provide fire rated box as required. Provide trim as required to comply with manufacturers instructions. Mount square and plumb. Install in accordance with ADA requirements. Coordinate exact location with architect and fire marshal.

Combined Sprinkler/Standpipe System:

Per NFPA 13.8.17.5.2.2, each connection from a standpipe that is part of a combined system to a sprinkler system shall have an individual control valve and check valve of the same size as the connection. See NFPA 13 Figure A.8.17.5.2.2(a)

A standpipe will be required any time the fire truck tires are 30'-0" or greater from the top occupied floor level. Coordinate with AHJ if pressure must be 100 psi at the top or if they will use their equipment to pressurize the standpipe(s). Comply as required.

NOTE: The existing Fire Pump and related equipment (controller, jockey pump, etc.) MUST be inspected prior to Bid. Any deficiencies shall be included in the Base Bid price to correct. Also provide full service for all equipment and materials that are to be re-used. Contractor shall verify the existing pump system will meet the complete requirements and intent of the Code AND AHJ's. Update, correct, and improve as necessary in the Base Bid.

If a new fire pump is required to meet the needed flow and/or pressure, a new service entrance rated controller shall be provided. Contractor shall notify GC during bid process if a change is required so that the GC can coordinate the changes with his electrical sub-contractor. System shall be turnkey functional at no additional cost to the Owner. Provide as a minimum, new gauges, labels, and isolation valves.

2.18 Pipe Joint Construction:

Welded Joints: AWS D10.9, Level AR-3.

Threaded Joints: Conform to ANSI B1.20.1, tapered pipe threads for field cut threads. Join pipe, fittings, and valves as follows:

Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.

Align threads at point of assembly.

Apply appropriate tape or thread compound to the external pipe threads.

Assemble joint to appropriate thread depth. When using a wrench on valves place the wrench on the valve end into which the pipe is being threaded.

Damaged Threads: Do not use a pipe with threads which are corroded or damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

Flanged Joints: Align flanges surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by the bolt manufacturer.

Mechanical Grooved Joints: Roll grooves on pipe ends dimensional compatible with the couplings.

End Treatment: After cutting pipe lengths, remove burrs and fins from pipe ends.

Valve Installations:

General: Install fire protection specialty valves, fittings, and specialties in accordance with the manufacturer's written instructions, NFPA 13 and 14, and the authority having jurisdiction.

Butterfly and Gate Valves: Install supervised-open valves so located to control all sources of water supply except fire department connections. Where there is more than one control valve, provide approved permanently marked identifications signs indicating the portion of the system controlled by each valve.

Install check valves in each water supply connection.

Chain wheels, guides, and chain loops shall be provided where valves are 10 feet or more above floor or shown on drawings.

Mount all valves so that the operating handle is readily accessible and so that the valve can be completely opened and closed.

Alarm Check Valves: Install valves in the vertical position, in proper direction of flow including the bypass check valve and retard chamber drain line connection. Install valve trim in accordance with the valve manufacturer's appropriate trim diagram. Test valve for proper operation.

Inspector's Test and Auxiliary Drain Valves shall be equipped with an approved keyed pad-lock and chain. Valves shall be lift in locked condition.

Sprinkler Head Installations:

Install sprinklers in center of ceiling tile by means of "return bends," and within tolerances of plus or minus 1/2 inch.

Install all Recessed Style Sprinklers equally recessed within tolerances of plus or minus 1/16 inch.

Install sprinkler guards on sprinkler which are so located as to be subject to mechanical injury (in either upright, pendent, or sidewall positions).

Use proper tools to prevent damage during installation.

Installed Sprinklers and Escutcheons with damaged finishes shall be replaced.

Install mechanical sleeve seal at pipe penetration in outside walls. Sleeve ALL wall and floor penetrations- no exceptions.

Identification:

Provide valve identification per NFPA 13 and valve tags. Provide framed valve tag schedules. Provide hydraulic calculation data card in frames meeting the same specification as per valve tags.

Provide FDC sign with minimum 1” raised or engraved letters- sign construction to match exterior signs provided or installed by the General Contractor.

Per NFPA 14.5.4.2, where a manual standpipe system is provided, each hose connection shall be provided with a conspicuous sign that reads “MANUAL STANDPIPE FOR FIRE DEPARTMENT USE ONLY.”

2.19 Field Quality Control:

Flush, test, and inspect sprinkler piping systems in accordance with NFPA 13 and in the presence of the Architect/Engineer, and Factory Mutual.

Replace piping system components which do not pass the test procedures specified, and retest repaired portion of the system.

Reports & Testing Requirements

Prior to making a request of Beneficial Occupancy the Fire Protection Contractor shall submit written test reports and certificates as required by NFPA 13, 14 and 24. Submittals shall include system acceptance form approved by NFPA only no other forms shall be considered.

2.2 TRAINING:

All systems shall be demonstrated to the Owner (and their designated personnel). This shall include all recommended operations and maintenance items/practices as well as basic trouble shooting. ALL sessions shall be recorded such that new personnel can watch the recording and benefit as if they were in attendance. Training sessions shall be provided on DVD, thumb drive, or other electronic storage media as desired by the Owner.

END OF SECTION 21 00 00

DIVISION 22 - PLUMBING

SECTION 22 05 00 - SUMMARY OF THE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General Conditions and Amendments, Supplementary Conditions, and Affirmative Action Policy for MWBE, all sections bound with these specifications shall be considered an integral part of this section.

B. The specifications and drawings shall be considered as supplementary to each other, requiring materials and labor indicated, specified, or implied by either specifications or drawings and shall be supplied and installed as though specifically called for by both.

C. Reference herein to "Engineer" refers to the firm of Consultant Engineering Service, Inc. of Winston-Salem, NC.

1.2 REGULATIONS AND CODES:

All work shall conform to the rules and regulations of the North Carolina Building Code, Plumbing Code, Energy Code, latest edition, and local plumbing inspector having jurisdiction. Should contract documents and these regulations conflict in any area, the regulations and codes shall be followed.

1.3 EXAMINATION OF SITE:

Before submitting a proposal the contractor shall examine the site, familiarize himself with all existing conditions and obtain all information required to enable him to provide a complete and satisfactory installation. The contractor's failure to comply with these requirements will not relieve him of the responsibility of any errors which might have been avoided by his compliance.

1.4 OPENINGS, CUTTING AND PATCHING:

A. Various openings, cutting, patching and steel or concrete lintels will be required for the installation of the mechanical work. Plumbing contractor shall provide steel lintels over every opening l2" and above.

B. The cutting of openings or holes in walls and cutting of holes in floors and ceilings shall be done in a manner as not to weaken the structure and any such work shall be coordinated with other contractors. All cuts shall be saw cut. Holes shall be cut exact and patch holes up to plumbing pipes.

C. Plumbing contractor will then be responsible to caulk between patching and pipe. All cuts thru finished walls shall be patched by general contractor and plumbing contractor shall reimburse general contractor for such work.

PROTECTION OF EQUIPMENT:

The contractor shall be responsible for all work damaged by him in executing contract. All work damaged by the contractor shall be replaced by him and placed in perfect working condition without extra cost. Any construction work damaged shall be made good. The contractor shall at all times be responsible for any damaged equipment or work in conjunction with executing contract.

1.5 GUARANTEE:

A. General Conditions shall apply to Guarantee and Warranty.

B. All guarantee failures shall be corrected or replaced by contractor as soon as possible after notification of such failure.

C. As a minimum, all work shall be guaranteed for a period of 12 months from the date of final acceptance, labor and material.

D. Compressors, water heaters, and other equipment may carry longer warranty requirements- consult drawings and specifications.

1.6 OPERATING INSTRUCTIONS:

A. At the completion of the work the contractor shall furnish architects (3) booklets containing engineering data and cuts of all equipment along with typed or printed operating instructions. If submittals are electronically provided, also provide a DVD or thumbdrive with all submittals and IOM manuals.

B. Booklets shall be subject to approval. The contractor shall provide a competent instructor to advise the owner or his representative of the proper operation and servicing of equipment installed.

1.7 WORK INCLUDED:

All labor and materials to provide a complete plumbing system as shown on the drawings. Provide all accessory and incidental items, contingencies, light, electrical energy, temporary wiring, scaffolding, fixtures, tools, transportation, etc. necessary for the proper installation of all work described in this section of the specifications.

Seismic Restraint: During design documents phase, the building was classified as Seismic Design Category "C". Consult Structure Drawings to verify if this changed. If it remains a "C" or "D", all natural gas piping and gas fired equipment (water heaters) shall be seismically restrained. A letter from a registered NC professional engineer that the system is installed (and inspected) in compliance with the code.

PART 2 - PRODUCTS

2.1 STANDARDS OF MATERIALS:

All materials used shall be new unless otherwise shown or called for, and shall be furnished in accordance with standard specification of the American Society for Testing Materials, the American Society of Mechanical Engineers, and other guide specifications.

2.2 CONFORMANCE TO SPECIFICATIONS AND SUBMITTAL OF MATERIALS:

A. Drawings are based on first manufacturer named in specifications. Contractor shall bear any costs altering any other contract or sub-contract resulting from a substitution of equipment for that specified or on which drawings and specifications are based. Where any material or equipment is specified by name of identification of one or more specific manufacturers, and there is no "or equal" wording following the manufacturers listed, then such material or product shall be furnished by the manufacturer (or one of the manufacturers) listed without substitution. Engineers, in these cases, will not consider other manufacturers for approval unless added by addendum. All manufacturers that are not specifically named must be pre-approved at least ten (10) days prior to bid opening. Submission must be made by a bona fide bidder, not a vendor.

B. Where any material or equipment is specified by name or identification of one or more specific manufacturers, and there is "or equal" wording following the manufacturers listed, then the contractor may submit for approval any substitute which is equivalent in general appearance, construction, quality and performance to that specified.

C. A triplicate typewritten listing of all materials and equipment (showing specific manufacturer) hereinafter specified or shown on the drawing or required for the complete and proper installation of the mechanical contract involved shall be furnished to the architects and engineers within two weeks after the date of contract signing. The list shall include all specified and proposed substitute items as acceptable under above paragraph.

D. After approval of the list of materials and equipment, one copy shall be returned to the contractor, who shall then proceed with submittal data not submitted with list, including resubmittal of any disapproved items. All submittal data shall be furnished within 30 days after date of contract signing by this contractor.

E. A maximum of six (6) copies of submittal data shall be furnished. The contractor shall copy the marked-up submittals if they need additional copies (three marked sets will be returned if six copies are provided). Electronic pdf copies of submittals will be accepted.

2.3 SHOP DRAWINGS:

A. Shop drawings of all materials or fabricated work shall be submitted for approval. Six sets of such prints must be presented, and no work shall be done until such approval has been obtained.

B. The approval of shop drawings will be general and shall not relieve the contractor from the responsibility for adherence to the contract nor shall it relieve him of the responsibility for any error which may exist.

2.4 EQUIPMENT VARIATIONS:

Should contractor submit substitutes which vary in horsepower, electrical characteristics, physical size, number of motors, etc. from those specified, contractor shall bear any and all expenses that may arise in other contractor's work that must be altered to allow use of such substitute equipment. Approval of any such equipment shall be voided should contractor fail to bear any such expenses.

2.5 FIRE-STOPPING

A. Fire-Resistant Sealant: Provide one-part elastomeric sealant formulated for use in a through-penetration fire-stop system for filling openings around pipe penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction. Contractor shall follow required UL listing for the system used as required. Submit copy of UL listing to engineer/AHJ prior to installation.

B. Products: Subject to compliance with requirements, provide one of the following:
- "Dow Corning Fire Stop Foam"; Dow Corning Corp.
- "Pensil 851"; General Electric Co.
- "Dow Corning Fire Stop Sealant"; Dow Corning Corp.
- "3M Fire Barrier Caulk CP-25"; Electrical Products Div./3M.
- "RTV 7403"; General Electric Co.
- "Fyre Putty"; Standard Oil Engineered Materials Co.

PART 3 - EXECUTION

3.1 DIAGRAMS AND COORDINATION:

A. The drawings are diagrammatic and shall be followed as closely as possible. However, the contractors shall be responsible to coordinate their installation and work out interferences that might occur among themselves. Should interferences occur, the engineers will assist in working them out in the best interests of all contractors concerned and with as little change in the systems as originally planned as possible.

B. The drawings indicate offsets and transitions required, but by no means indicate all such situations. Should contractor elect to prefabricate piping, he shall do so at the risk of having to make field changes to avoid structure, or other trades, at his own expense. Owners, architects, and engineers shall not be liable for extra expenses involved because of the contractor's failure to include adequate allowance in his price for such field problems. Do NOT scale these drawings.

C. Contractor shall consult architectural and structural drawings for all dimensions, ceiling heights, beam depths, locations of partitions, kind and number of fixtures or pieces of equipment, structural member locations, etc. Ductwork shall take precedence over any conflicting water piping in same area.

D. The PC shall obtain the architectural base plan model from the architect. A meeting of all trades shall be required for each area of the building to identify proposed routings and options. A coordination drawing schedule for each area must be agreed upon and signed off- provide copy to the Design Team. The building has verify limited height floor to floor!

E. The PC shall then produce plumbing coordination drawings (while having regular conversations and meetings with all other trades) with all piping and equipment. The drawings shall be to scale, dimensioned and clearly identified. The drawings shall indicate bottom of pipe for all equipment. Upon completion, forward to the Mechanical Contractor (MC) for incorporation into the overall coordination drawings. Adjust drawings as necessary during the coordination process.

F. The final overall coordination drawings/model must be completed prior to any plumbing, fire protection, mechanical and electrical work starting on the job.

G. The PC is responsible for purchasing his final overall coordination drawings from the printer.

H. In order to avoid any conflict with the site work, the PC shall make final connection to all utility connections. PC shall coordinate to ensure the alignment, elevations, and pipe materials allow proper connection. Coordinate all elevations and locations prior to construction. No changes will be approved based on failure to coordinate prior to start of construction.

I. **NOTE:** The existing "tunnel area" will remain in use by the Prison System. Verify all work (demo, modification, and new) does not impact or interrupt service to this area. Contractor shall include adequate time in the bid for tracing out existing piping to ensure the intent of the drawings is achieved.

3.2 TESTS:

A. Upon Completion of the installation, all systems shall be properly adjusted and tested by the contractor and placed in perfect operating condition, subject to the approval of the architects and engineers. Provide all labor and equipment to perform this work.

B. All tests for plumbing work shall be in strict accordance with local plumbing code and regulations and to the satisfaction of local plumbing inspector and architects and engineers. Where pressure testing is applicable, the test pressure shall be for l25 p.s.i.g. or 50% above working pressure,

whichever is the higher. Any defects indicated by the tests shall be corrected immediately by the contractor without cost to the owners.

C. The potable water system shall be flushed and cleaned in accordance with the NC Plumbing Code. PC shall have lab test conducted with the report included in the closeout documentation.

3.2.1 SPECIAL TESTING:

A. BELOW SLAB:
After the concrete slab is installed over the underground sewer, grease waste, condensate, and rainwater piping, PC shall flush the piping with water. After flushing clean, cap pipe outlet(s) beyond the building and fill with water. PC shall remove cap(s) and run a sewer camera inside the lines 3" and larger to look for any low spots in the pipe (or debris). The footage of the sewer camera shall be recorded and the data file cataloged and included in the closeout documentation so that the Owner can understand the piping being viewed. Repeat as necessary to obtain fully tested system without any low spots or debris. The Substantial Completion inspection cannot occur until the video has been reviewed and all underground waste piping systems have been approved by the Engineer of Record.

B. ABOVE SLAB:
After all fixtures are installed and traps are filled with water, PC shall set up a smoke test to be witnessed by the Engineer and Owner. PC shall provide smoke machine and fill all piping systems one at a time- provide adequate personnel to look above ceilings, in all rooms, etc. in an expedient manner. Correct leaks, seals, etc. and retest until 100% correct.

3.3 EXCAVATING AND BACKFILLING:

C. The contractor shall be responsible for all excavating in connection with the work in corresponding Plumbing Sections of the contract. All such excavating shall be done in a manner as not to endanger the stability of the structure or any part thereof, or any work in place by other contractors.

D. Refer to section 012000 for unit prices for trench rock removal and unsuitable soils.

E. Ditching variations from that indicated on plans shall be approved by the architects before excavating; no work shall be done until such approval has been obtained. Where outside ditches occur, finish surfaces as original to match existing, including patching of walks and paving. All backfilling material shall be installed and thoroughly compacted in 6 to 8 inch layers using sheep's foot rollers, mechanical tampers, or other suitable approved compaction equipment, of size and type required. All backfill within perimeter l0 feet beyond such areas, shall be compacted to at least l00% of maximum density at optimum moisture content throughout entire depth of backfill material. Maximum density with ASTM-D-698, method C. All other backfill shall be compacted same as previously described, except 95%. Provide necessary OSHA shoring for protection of trenches. No rock, trees, stumps rubbish, etc., shall be used for backfill and all such materials and surplus earth shall be removed by the contractor from the project and disposed of at his own expense where directed by the architects.

F. All underground lines outside building footprint shall be required to have a magnetic-type warning tape installed in the backfill at least 6 (six) inches below grade. Also a 12 gauge insulated copper wire shall be taped to any non-metallic pipes at 6' on center- terminate so that the Owner can easily find for tracing.

G. All outside of the building footprint piping systems 3" and larger shall have a minimum of cover to the top of pipe of 48".

3.4 CLEANING UP:

The contractor shall keep the property and building free of rubbish and waste material due to the installation of work included in this specification and shown on plans. After completion of the work and all tests have been made, the contractor shall remove all rubbish incidental to contract and shall leave all portions of the work in a clean condition.

3.5 INSPECTIONS:

The contractor must at all times lend any assistance necessary for architects or engineers or their authorized representative to make tests, inspections, etc. Provide all materials, equipment and labor necessary for tests or inspections as required.

3.6 PROGRESS:

The work must be installed as fast as the progress of the other trades will permit and when directed by the architects and engineers. Coordinate phasing schedule with general contractor. Provide after-hours and/or temporary valves/piping/etc. as required to avoid interruption of normal operation if is not opened at one time.

3.7 WORKMANSHIP:

All materials and equipment shall be installed and completed in a first class workmanlike manner. The architects and engineers reserve the right to reject any damaged equipment and to direct the removal and replacement of any item, which in their opinion shall not represent acceptable workmanship. Such removal and replacement shall be done when directed in writing by architects and engineers at the contractor's expense and without additional cost to the owner.

3.8 SPECIFICATIONS AND DRAWINGS:

In the case of discrepancy between drawing and specifications, drawings and drawings, or the differences in general conditions, supplementary general conditions or term and conditions for all contractual work, the better quality and greater quantity shall govern.

3.9 FEES AND PERMITS:

The plumbing contractor shall obtain and pay for all permits relating to plumbing contract, arrange for necessary inspections and furnish a certificate of inspection and approval from the public authority and underwriters having jurisdiction where the apparatus is installed. All fees and charges in connection with the above shall be paid for by plumbing contractor.

3.10 COMMISSIONING:

All pumps, water heaters, gas and water pulse meters, and equipment provided shall have a factory start-up.
1. Demonstrate that all functions of the domestic water heating system meet the specified requirements.
2. Demonstrate that all functions of the water and gas pulse meters controls meet the specified requirements.
3. Demonstrate that all functions of the elevator sump pump system meets the specified requirements.

3.11 TRAINING:

All systems shall be demonstrated to the Owner (and their designated personnel). This shall include all recommended operations and maintenance items/practices as well as basic trouble shooting. ALL sessions

shall be recorded such that new personnel can watch the recording and benefit as if they were in attendance. Training sessions shall be provided on DVD, thumb drive, or other electronic storage media as desired by the Owner.

END OF SECTION 22 05 00

SECTION 22 05 10 - BASIC PLUMBING MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and the Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. Refer to individual piping system specification Sections for pipe and fitting materials and joining methods.

B. NOTE: The building utilizes a plenum return system in many areas. All piping (and insulation) must be rated for installation in a plenum meet the ASTM E84, 25/50 flame smoke rating.

C. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual piping system specification Sections in Division 22 for special joining materials not listed below.

B. Solder Filler Metal: ASTM B 32.

C. Alloy Sn95: Tin (approximately 95 percent) and silver (.40 to .60 percent) having lead content meeting Federal approval.

D. Solder joints in copper pipe shall be made with 95% tin, 5% antimony solder up to and including 2" pipe. Use brazing solder for joints in pipes above 2".

2.4 PIPING SPECIALTIES

A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type where required to conceal protruding fittings and sleeves.

B. Inside Diameter: Closely fit around pipe, tube, and insulation.

C. Outside Diameter: Completely cover opening.

D. Stamped Steel: One-piece, with set-screw and chrome-plated finish.

E. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals to prevent galvanic action and stop corrosion.

F. Dielectric Unions: Factory-fabricated, union assembly for 250-psig minimum working pressure at a 180 deg F temperature.

2.5 IDENTIFYING DEVICES AND LABELS

A. Equipment Nameplates: Metal nameplate with operational data engraved or stamped, permanently fastened to equipment.

B. Snap-On Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid snap-on, color-coded pipe markers, conforming to ASME A13.1.

C. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore.

D. Fabricate in sizes required for message.

E. Engraved with engraver's I/2" high standard letter style, of sizes and with wording to match equipment identification.

F. Punch for mechanical fastening.

G. Thickness: 1/8 inch.

H. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.

I. Labeling and Identification Use a phenolic tag, tape label, or color dot stickers placed on ceiling grid where plumbing isolation valves are installed above. Color scheme and labels shall be in accordance with owner's coding standard or per ANSI/ASME A13.

2.6 VALVES: Provide numbered brass tags for all valves- attach to handle. Provide index/drawing under glass in the main mechanical room with the water riser to identify location.

2.7 GROUT

A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.

B. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

C. Design Mix: 5000-psi (34.50MPa), 28-day compressive strength.
D. Packaging: Premixed and factory-packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS--COMMON REQUIREMENTS

A. General: Install piping as described below, except where system sections specify otherwise. Individual piping system specification Sections in Division 22 specify piping installation requirements unique to the piping system.

B. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.

C. Install components having pressure rating equal to or greater than system operating pressure.

D. Install piping free of sags and bends.

E. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated.

F. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

G. Install piping to allow application of insulation plus 1-inch clearance around insulation.

H. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

I. Install fittings for changes in direction and branch connections.

J. Install couplings according to manufacturer's printed instructions.

K. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings.

L. Install sleeves for pipes passing through concrete and masonry walls, concrete floor and roof slabs.

M. Install large enough sleeves to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

N. Steel Pipe Sleeves: For pipes smaller than 6 inches.
O. Steel Sheet-Metal Sleeves: For pipes 6 inches and larger that penetrate gypsum-board partitions.

P. Cast-Iron Sleeve Fittings: For floors having membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.

Q. Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.

R. Except for below-grade wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants.

S. Below Grade, Exterior Wall, Pipe Penetrations: Install cast-iron wall pipes for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installation of mechanical sleeve seals.

T. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping sealant material.

U. Verify final equipment locations for roughing in.

V. Refer to equipment specifications in other Sections for roughing-in requirements.

W. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping system Sections.

X. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

Y. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

Z. Soldered Joints: Construct joints according to AWS "Soldering Manual," Chapter 22 "The Soldering of Pipe and Tube."

AA. Brazed Joints: Construct joints according to AWS "Brazing Manual" in the "Pipe and Tube" chapter.

BB. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full inside diameter. Join pipe fittings and valves as follows:

CC. Piping Connections: Make piping connections as specified below.
DD. Install unions in piping 2 inches and smaller adjacent to each valve and at final connection to each piece of equipment having a 2-inch or smaller threaded pipe connection.

EE. Wet Piping Systems (Water and Steam): Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

FF. Plumbing Vents Through Roof (VTR): In order to minimize odor transfer, all VTR's must be a MINIMUM of 15' from any fresh air intake.

3.2 EQUIPMENT INSTALLATION--COMMON REQUIREMENTS

A. Install equipment to provide the maximum possible headroom where mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Engineer.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.

D. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.

E. Install equipment giving right-of-way to piping systems installed at a required slope.

3.3 LABELING AND IDENTIFYING

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

B. Plastic markers, with application systems. Install on pipe insulation segment where required for hot noninsulated pipes.

C. Locate pipe markers wherever piping is exposed in finished spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums), above lay-in ceilings and exposed exterior locations as follows:

D. Near each valve and control device.

E. Near each branch, excluding short take-offs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is not obvious.

F. Near locations where pipes pass through walls, floors, ceilings, or enter inaccessible enclosures.

G. At access doors, manholes, and similar access points that permit view of concealed piping.

H. Near major equipment items and other points of origination and termination.

I. Spaced at a maximum of 20-foot intervals along each run.

J. On piping above removable acoustical ceilings.

3.4 PAINTING AND FINISHING

Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 CONCRETE BASES

Construct concrete equipment bases of dimensions indicated, but not less than 4 inches larger than supported unit in both directions. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi, 28-day compressive strength concrete.

3.6 GROUTING

A. Install nonmetallic nonshrink grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's printed instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms for placement of grout, as required.

D. Avoid air entrapment when placing grout.

E. Place grout to completely fill equipment bases.

F. Place grout on concrete bases to provide a smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's printed instructions.

END OF SECTION 22 05 10

SECTION 22 05 13 - ELECTRICAL REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

a. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

b. Related Sections: Separate electrical components and materials required for field installation and electrical connections are specified in Division 26.

1.2 SUMMARY:

a. This section specifies the basic requirements for electrical components which are an integral part of packaged mechanical equipment. These components include, but are not limited to factory installed motors, starters, and disconnect switches furnished as an integral part of packaged mechanical equipment.

b. Specific electrical requirements (i.e. horsepower and electrical characteristics) for mechanical equipment are specified within the individual equipment specification sections, and/or scheduled on the drawings.

1.3 REFERENCES:

Comply with National Electrical Code (NFPA 70).

1.4 SUBMITTALS:

No separate submittal is required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification sections

1.5 QUALITY ASSURANCE:

Electrical components and materials shall be UL labeled.

PART 2 - PRODUCTS

2.1 MOTORS:

The following are basic requirements for simple or common motors.

For special motors, more detailed and specific requirements are specified in the individual equipment specifications.

Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.

Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.

2-speed motors shall have 2 separate windings on poly-phase motors.

Temperature Rating: Rated for 40 deg. C environmental with maximum 50 deg. C temperature rise for continuous duty at full load (Class A Insulation).

Starting capability: Frequency of starts as indicated by automatic control system, and not less than 5 evenly time spaced starts per hour for manually controlled motors.

Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.

Motor construction:

All motors shall have the NEMA premium-efficiency rating stamped on the nameplate.

Frames: NEMA Standard No. 48 or 54; use driven equipment manufacturer's standards to suit specific application.

Bearings:

Ball or roller bearings with inner and outer shaft seals; Re-greasable, except permanently sealed where motor is normally inaccessible for regular maintenance;

Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.

For fractional horsepower, light duty motors, sleeve type bearings are permitted.

Enclosure Type: Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation;

Guarded drip-proof motors where exposed to contact by employees or building occupants;

Weather protected Type I for outdoor use, Type II where not housed;

Overload protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.

Noise rating: "Quiet"

Noise rating: "Quiet" rating on motors located in occupied spaces of building.

Efficiency: "Premium Efficient" motors shall have a minimum efficiency as scheduled in accordance with IEEE Standard 112, test method B.

Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

STARTERS, ELECTRICAL DEVICES, AND WIRING:

Motor Starter Characteristics:

Enclosures: NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 3R with conduit hubs, or units in hazardous locations which shall have NEC proper class and division.

Type and size of starter shall be as recommended by motor manufacturer and the driven equipment manufacturer for applicable protection and start-up condition. All starters and disconnects shall be heavy duty.

Manual switches shall have: Pilot lights and extra positions for multi-speed motors.

Overload protection: Melting alloy type thermal overload relays.

Magnetic Starters: Hand-off-auto switch with pilot light, properly arranged for single speed or multi-speed operation as indicated.

Trip-free thermal overload relays, each phase.

Interlocks, pneumatic switches and similar devices as required for coordination with control requirements of Division-23 Controls section.

Built-in 120 volts control circuit transformer, fused from line side, where service exceeds 240 volts.

Externally operated manual reset.

Under-voltage release or protection.

Motor connections:

Flexible conduit, except where plug-in electrical cords are specifically indicated.

Disconnect Switches:

Fusible switches: Fused, each phase; heavy duty; horsepower rated; non-feasible heavy quick-make, quick-break mechanism; dead front line side shield; solderless lugs suitable for copper or aluminum conductors; spring reinforced fuse clips; electro silver plated current carrying parts; hinged doors; operating lever arranged for locking in the "OPEN" position; arc quenchers; capacity and characteristics as indicated.

Non-fusible switches: For equipment 1 horsepower and smaller, shall be horsepower rated; toggle switch type; quantity of poles and voltage rating as indicated. For equipment larger than 1 horsepower, switches shall be the same as fusible type.

PART 3 - EXECUTION

a. Provide separate disconnect at load where motor (or electrical load) is not within sight of starter, or more than 50 feet from starter. Where starters are not within sight of feeding electrical panel, provide heavy duty combination starter-disconnect. Where starters for such loads are built-in equipment package, provide separate disconnect. Where such disconnects located outside structure, they shall be raintight type.

b. Electrical contractor will provide one power supply to each electrically operated item of equipment in contract. Should such items of equipment contain more than one electrical load, the Plumbing Contractor shall be responsible to provide circuit breakers or fuse blocks to protect such load, plus gutters and troughs to distribute such loads.

c. Note: Plumbing Contractor shall furnish and install starters and disconnects. Electrical Contractor will then wire to line side of each starter and disconnect. Electrical Contractor shall also wire from load side of each starter and disconnect to the respective motor terminals. All wire, conduit and junction boxes shall conform to electrical specifications. All work shall be performed by a licensed electrician.

END OF SECTION 22 05 13

SECTION 22 05 23 - PLUMBING VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to this section.

1.2 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data, including body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Manufacturer: Subject to compliance with requirements, provide products from one of the manufacturers listed in valve schedule.

2.2 VALVE FEATURES, GENERAL

A. Valve Design: Rising stem or rising outside screw and yoke stems.

B. Nonrising stem valves may be used where headroom prevents full extension of rising stems.

C. Pressure and Temperature Ratings: As scheduled and required to suit system pressures and temperatures.

D. Sizes: Same size as upstream pipe, unless otherwise indicated.

E. Operators: Provide the following special operator features:

F. Handwheels, fastened to valve stem, for valves other than quarter turn.

G. Lever handles, on quarter-turn valves.

H. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.

I. End Connections: As indicated in the valve specifications.

J. Threads: Comply with ANSI B1.20.1.

K. Solder-Joint: Comply with ANSI B16.18.

2.3 GATE VALVES:

Note: Gate valves are not allowed unless special circumstances and written permission from engineer.

2.4 BALL VALVES

Ball Valves, Up thru 4-Inch: Rated for 150 psi saturated steam pressure, 400 psi WOG pressure; 2-piece construction; with bronze body conforming to ASTM B 62, full port, chrome-plated brass or stainless ball, replaceable "Teflon" or "TFE" seats and seals, blowout proof stem, and vinyl-covered steel handle. Provide solder ends.

2.5 GLOBE VALVES

Globe Valves, 2-Inch and Smaller: MSS SP-80; Class 125; body and screwed bonnet of ASTM B 62 cast bronze; with threaded or solder ends, brass or replaceable composition disc, copper-silicon alloy stem, brass packing gland, "Teflon" impregnated packing, and malleable iron handwheel. Provide Class 150 valves meeting the above where system pressure requires.

2.6 CHECK VALVES

Swing Check Valves, 2-Inch and Smaller: MSS SP-80; Class 125, cast-bronze body and cap conforming to ASTM B 62; with horizontal swing, Y-pattern, and bronze disc; and having threaded or solder ends. Provide valves capable of being reground while the valve remains in the line. Provide Class 150 valves meeting the above specifications, with threaded end connections, where system pressure requires or where Class 125 valves are not available.

PART 3 - EXECUTION

3.1 VALVE INSTALLATIONS

A. General Application: Use ball for shut-off duty; globe and ball for throttling duty. Provide ball valves to cut off each group of fixtures, as per N.C. Plumbing Code, even if valves were inadvertently omitted from plans.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves and unions for each fixture and item of equipment arranged to allow equipment removal without system shutdown.

D. Install full size three-valve bypass around each pressure reducing valve using throttling-type valves.

E. Install valves in horizontal piping with stem at or above the center of the pipe.

F. Install valves in a position to allow full stem movement.

G. Install identification phenolic tag or sticker (if allowed) on the grid under valves. Also provide brass valve tags and valve tag chart in the main mechanical room.

H. Installation of Check Valves: Install for proper direction of flow as follows:

3.2 SOLDER CONNECTIONS

A. Cut tube square and to exact lengths.

B. Clean end of tube to depth of valve socket with steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket in same manner.

C. Apply proper soldering flux in an even coat to inside of valve socket and outside of tube.

D. Apply Sterling, or approved equal "lead-free" solder around joint.

3.3 FIELD QUALITY CONTROL

Tests: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect valves for leaks. Adjust or replace packing to stop leaks; replace valves if leak persists.

VALVE SCHEDULE

Ball Valves - Up thru 4 Inch:

MANUFACTURER	THREADED ENDS	SOLDER ENDS
Conbraco (Apollo)	82-100	70LF-200
Grinnell	3810	3810SJ
Nibco	T-590-Y	S-590-Y
Watts	B-6080	B-6081

Globe Valves - 2 Inch and Smaller:

MANUFACTURER	CLASS 125 THREADED	SOLDER	CLASS 150 THREADED
Crane	1	1310	17TF
Grinnell	3210	3210SJ	3240
Milwaukee	502	1502	590
Nibco	T-211-B	S-211-B	T-235-Y

Globe Valves - 2-1/2 Inch and Larger:

MANUFACTURER	STRAIGHT BODY	ANGLE BODY
Crane	351	353
Grinnell	6200A	x
Milwaukee	F2981	F2986
Nibco	F-718-B	F-818-B

x means not available.

Swing Check Valves - 2 Inch and Smaller:

MANUFACTURER	CLASS 125 THREADED ENDS	SOLDER ENDS	CLASS 150 THREADED ENDS
Crane	37	1342	137
Grinnell	3300	3300SJ	3320
Milwaukee	509	1509	510
Nibco	T-413	S-413	T-433

NOTE: GATE VALVES ARE NOT ACCEPTABLE.

END OF SECTION 22 05 23

SECTION 22 05 29 - PLUMBING HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawing and general provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

This Section includes hangers and supports for piping and equipment. Consult schedule at end of this section for hanger model numbers.

1.3 SUBMITTALS

Product data for each type of hanger and support.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

Available Manufacturers: Subject to compliance with requirements, provide products from one of manufacturers listed below.

Hangers: B-Line
Grinnell
Michigan
PHD

2.2 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.

C. Washers: ASTM F 844, steel, plain, flat washers.

D. Coat all ferrous items with rust inhibiting black paint immediately after installation to prevent rust and corrosion.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Arrange for grouping of parallel runs of horizontal piping supported together heavy-duty trapeze hangers utilizing "Unistrut" style channels, spring nuts and rods coordinated with HAC piping.

C. Truss Support Connections: Provide “stiff legs” if pipe support is not a joist panel point- refer to structural drawing for required detail. Provide double nut for all threaded rods.

D. Support pipes l" and smaller, 8'-0" on centers. l-l/4" and larger on l0'-0" centers. Provide hanger on each pipe extending from fitting at change of direction or tee. Note: If piping other than metallic is

approved and used, adjust hanger spacing to 4' on center or as required by the NC Plumbing Code and the manufacturer Installation Manual.

E. Install building attachments within concrete or to structural steel. Space attachments as indicated above. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts. Install concrete inserts in new construction prior to placing concrete.

F. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches (100 mm) thick. Verify with structural engineer and their drawings for additional limitations. Do not support anything from the roof decking!

G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

H. Clamps and brackets: Where pipes are run horizontally to groups of fixtures in wall chases, they shall be held in place rigidly with wall brackets if near wall, or from welded plate if free standing. Where piping is roughed through wall to fixtures, faucets, etc. it shall be securely anchored in (or behind) wall and B-line, or equal standard clamps on steel pipe and figure 30l copper plated clamps on copper tubing. Wood wedges for this purpose will not be acceptable. Where piping is roughed out of wall for lavatories, provide "Rapid-Rough" guides to align roughing perfectly. Offset or unsymetrical roughing shall be considered poor workmanship and subject to removal and replacement.

I. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.

J. Insulated Piping: Hangers shall be sized to pass both insulation and pipe where insulation occurs.

K. Provide sway bracing and restraints for all piping 3" and larger.

3.2 PIPE HANGER SCHEDULE

Insulated Piping – B-line 3170NF galvanized adjustable swivel ring with shield.
Bare Copper Piping – B-line B3174CTC copper plated with plastic coating.
Other Bare Piping – B-line B3100.

NOTE: ALL HANGERS exposed in mechanical rooms or utility closets shall be painted black- no exceptions! Also any hangers in exposed occupied areas shall be painted black along with the threaded rod. Saddles must be clean and neatly installed.

END OF SECTION 22 05 29

SECTION 22 07 00 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

This Section includes pipe, and equipment insulation.

1.3 SUBMITTALS

Product data for each type of mechanical insulation identifying k-value, thickness, and accessories.

1.4 QUALITY ASSURANCE

A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.

B. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

C. The HVAC system uses a plenum return- all piping and insulation shall conform.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Glass Fiber:

- Certain Teed Corporation.
- Knauf Fiberglass GmbH.
- Manville.
- Owens-Corning Fiberglas Corporation. USG Interiors, Inc. - Thermafiber Division.

Flexible Elastomeric Cellular:

- Armstrong World Industries, Inc.
- Halstead Industrial Products.
- Rubatex Corporation.

2.2 GLASS FIBER

A. Material: Inorganic glass fibers, bonded with a thermosetting resin.

B. Jacket: All-purpose, factory-applied, laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.

C. Preformed Pipe Insulation: ASTM C 547, Class 1, rigid pipe insulation, jacketed.

D. Thermal Conductivity: 0.26 average maximum at 75 deg F mean temperature.

E. Density: 10 average maximum.

F. Adhesive: Produced under the UL Classification and Follow-up service.

G. Type: Non-flammable, solvent-based.

H. Service Temperature Range: Minus 20 to 180 deg F.

2.5 FLEXIBLE ELASTOMERIC CELLULAR

A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.

B. Tubular Materials: ASTM C 354, Type I.

C. Sheet Materials: ASTM C 354, Type II.

D. Thermal Conductivity: 0.30 average maximum at 75 deg F.

E. Coating: Water based latex enamel coating recommended by insulation manufacturer.

2.6 ADHESIVES

Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.
Lagging Adhesive: MIL-A-3316C,non-flammable adhesive.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.

B. Install insulation with smooth, straight, and even surfaces.

C. Seal Ends: Except for flexible elastomeric insulation, taper ends at 45 degree angle and seal with lagging adhesive. Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.

D. Apply adhesives and coatings at manufacturer's recommended coverage-per-gallon rate.

E. Keep insulation materials dry during application and finishing.

3.2 PIPE INSULATION INSTALLATION, GENERAL

A. Tightly butt longitudinal seams and end joints. Bond with adhesive.

B. Apply insulation with integral jackets as follows:

C. Pull jacket tight and smooth.

D. Cover circumferential joints with butt strips, at least 3-inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.

E. Longitudinal Seams: Overlap seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches on center.

F. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.

G. Flanges, Fittings, and Valves - Interior Exposed and Concealed: Coat pipe insulation ends with vapor barrier coating. Apply premolded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.

H. Use same material and thickness as adjacent pipe insulation.

I. Overlap nesting insulation by 2inches or 1-pipe diameter, which ever is greater.

J. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.

K. Insulate elbows and tees smaller than 3-inches pipe size with premolded insulation.

L. Insulate elbows and tees 3 inches and larger with premolded insulation or insulation material segments. Use at least 3 segments for each elbow.

M. 3.3 GLASS FIBER PIPE INSULATION INSTALLATION

N. Bond insulation to pipe with lagging adhesive. al exposed ends with lagging adhesive. Seal seams and joints with vapor barrier compound.

3.4 FLEXIBLE ELASTOMERIC CELLULAR PIPE INSULATION INSTALLATION

A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.

B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.

C. Miter cut materials to cover soldered elbows and tees.

D. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

3.5 GLASS FIBER EQUIPMENT INSULATION INSTALLATION

A. Secure insulation with anchor pins and speed washers. Space anchors at maximum intervals of 18 inches in both directions and not more than 3 inches from edges and joints.

B. Apply a smoothing coat of insulating and finishing cement to finished insulation.

3.6 FLEXIBLE ELASTOMERIC CELLULAR EQUIPMENT INSULATION INSTALLATION

A. Grooved and score insulation material as required to fit closely as possible to contour of equipment.

B. Apply full coverage of adhesive to the surfaces of the equipment and to the insulation.

C. Butt insulation joints firmly together and apply adhesive to insulation edges at joints.

3.7 APPLICATIONS

A. General: Materials and thicknesses are specified in schedules at the end of this Section.

B. Unless otherwise indicated, insulate the following piping systems:

1. Domestic cold water.
2. Domestic hot water and recirculating hot water.
3. Sanitary drains for fixtures accessible to the disabled.
4. Roof drain and auxiliary roof drains – all bodies, horizontal piping and vertical piping when cast iron. PVC pipe (where permitted) shall have horizontal piping and vertical exposed piping insulated.
5. Drains, traps, and piping above grade, which receive condensate from HVAC equipment and icemakers.

DOMESTIC CW HW & HWC PIPE INSULATION SCHEDULES:

PIPE SIZES (NPS) MATERIALS	THICKNESS IN INCHES
All Glass Fiber:	1"
All Flexible Elastometric:	3/4"(inside interior walls)

Note: Due to consistent problems with the flexible elastomeric joints and seams remaining sealed, this material will only be allowed inside wall cavities.
Increase insulation thickness as required to achieve current Energy Code requirement.

RW & ERW PIPE INSULATION SCHEDULES:

PIPE SIZES (NPS) MATERIALS	THICKNESS IN INCHES
All Glass Fiber:	1 " (piping & RD bodies)

CONDENSATE & SAN RECEIVING CONDENSATE PIPE INSULATION SCHEDULES:

PIPE SIZES (NPS) MATERIALS	THICKNESS IN INCHES
All Glass Fiber:	1"

3.8 JACKETS
All exposed piping shall be covered with color coded PVC jacket. If the exposed piping is in an occupied space, consult architect for color. All mechanical rooms and penthouses shall be considered exposed-provide color coded PVC jacket. Piping above the ceiling is considered concealed.

END OF SECTION 22 07 00

SECTION 22 10 00 - PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Refer to piping isometrics for group toilet requirements (HW, CW, San, Vent, etc.). All piping shall run parallel or perpendicular to the structure. Underground piping is diagrammatic only - bury lines away from walls and footings as far as practical. PC responsible for verifying ALL inverts prior to construction and coordinating with structural drawings and GC.

C. All piping and fittings shall be best grade.

D. Note: The HVAC system uses a plenum return- confirm locations- all piping and insulation shall conform to ASTM E84, 25/50 flame smoke rating.

E. NOTE: The building is classified as "HIGH RISE". Provide supports, bracing, etc. as necessary.

PART 2 - PRODUCTS

2.1 PIPES AND TUBES

A. Hard Copper Tube: ASTM B 88, Types L, water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Types K, water tube, annealed temper.

C. Steel Pipe: ASTM A 53, Type S, Grade A, Schedule 40, seamless, galvanized, plain ends.

D. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53 or ASTM A 106, Schedule 40, seamless, galvanized, carbon-steel pipe.

E. Ductile-Iron Pipe: AWWA C151, Pressure Class 350 with ultimate tensile strength of 60,000 psi, 42,000 psi yield strength and elongation of 10 percent, mechanical joint and push-on joint, with AWWA C104 cement-mortar lining.

F. Hub and Spigot, Cast-Iron Soil Pipe: ASTM A 74, Service Class.

G. PVC Pipe: Sch 40, ASTM D2665 made to ASTM D3311

H. PVC Soil Pipe: ASTM D3034 for DR 35 Johns-Manville Ring Tite, or similar approved equal for county sewer main.

I. Detectable Marking Tape: All PVC pipe shall have a 2" wide marking tape installed not more than 18" below grade. Tape shall be detectable by a metal locator equal to Lineguard, Inc. Tape shall be labeled "Caution- Buried Plumbing Line Below". All PVC pipe outside the building shall have 14 gauge copper locating wire taped to the pipe every six feet. Terminate locating wire so that the Owner can utilize.

2.2 PIPE FITTINGS AND TUBE FITTINGS

A. Wrought-Copper, Solder-Joint Pressure Fittings: ASME B16.22.

B. Copper Unions: ASME B16.18, cast-copper-alloy body, hexagonal stock, with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends.

C. Threaded Ends: Threads conforming to ASME B1.20.1.

D. Galvanized, Cast-Iron Threaded Drainage Fittings:
E. ASME B16.12, recessed drainage pattern, with threads conforming to ASME B1.20.1.

F. Ductile-Iron and Gray-Iron Gasketed Fittings: AWWA C110 standard pattern or ductile-iron AWWA C153 compact pattern, 250 psig minimum pressure rating, with AWWA C104 cement-mortar lining and AWWA C111 rubber gaskets.

G. Hub and Spigot, Cast-Iron Soil Pipe Fittings: ASTM A 74, Service Weight.
H. PVC Fittings: ASTM D 2665 socket fittings, ASTM F409 with heavy duty solvent cemented joints.

JOINING MATERIALS

A. Solder, brazing, and welding filler metals are specified in Division 22 Section "Basic Mechanical Materials and Methods."

B. Cast-Iron Soil Pipe and Fittings: ASTM C 564 neoprene rubber gaskets and lubricant.
C. Ductile-Iron Pipe and Ductile-Iron Fittings: The following materials apply:

D. Mechanical Joints: AWWA C111 ductile-iron glands, high-strength steel bolts and nuts, and rubber gaskets.

PART 3 - EXECUTION

All pipe shall be installed according to the NC Building Code and local county Specifications. Consult local authority for any special requirements prior to bidding. Contractor shall be responsible for complying with all requirements.

3.1 PREPARATION OF FOUNDATION FOR BURIED PIPING

A. Grade trench bottom to provide smooth, firm, stable, and rock-free foundation throughout length of piping.

B. Remove unstable, soft, and unsuitable materials at surface on which piping is to be laid and backfill with clean sand or pea gravel to indicated level.

C. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped-sand backfill. Dig bell holes at each pipe joint to relieve bells of loads and to ensure continuous bearing of pipe barrel on foundation.

3.2 PIPE AND FITTINGS APPLICATIONS

A. General: Use pipe, tube, fittings, and joining methods for piping systems according to the following applications. All sanitary, drain, and vent piping, rainwater and emergency rainwater piping, condensate drain piping located in a return air plenum shall be no-hub cast iron standard no-hub couplings.

B. Water Distribution Piping Below Ground: Use the following:
C. 4 to 6 Inches: Ductile iron with mechanical joint fittings.

D. 3 Inches and Smaller: Type K, cast-copper-alloy solder-joint pressure fittings- no joints inaccessible. Any joints require special permission and shall be brazed.

E. Water Distribution Piping Above Ground: Use the following:
F. 4 Inches and Smaller: Hard copper tube, Type L; cast-copper-alloy pressure fittings; copper unions. Pipe 2-1/2" and larger shall be brazed and smaller pipe solder joints with Alloy Sn95 solder (lead free).

G. Condensate Drain Piping Below Ground: Use the following:
H. 2 to 15 Inches: Sch 40 PVC with appropriate fittings except in return air plenums and rated wall penetrations requiring cast iron. All pipes rising in 4-hour rated walls shall be cast iron.

I. Soil, Waste, Vent, Rainwater Piping Below Building Slab: Use the following:
J. Sch. 40 PVC with appropriate fittings except in return air plenums and rated wall penetrations requiring cast iron. All pipes rising in 4-hour rated walls shall be cast iron. (Cellular core "foam core" pipe will not be allowed).

K. Grease waste kitchen piping and boiler room drain piping shall be hub and spigot cast iron due to the potential discharge temperatures exceeding 140 deg F.

L. Soil, Waste, Vent, Rainwater Piping Above Grade: Use the following:
M. Above ground waste/rainwater and vent shall be hubless cast-iron pipe: hubless cast-iron soil pipe fittings: stainless-steel, couplings for hubless cast-iron soil pipe and fittings. Note: Vents may be Sch 40 PVC, ASTM D2665 where not located in return air plenums.

N. Condensate Drain Piping: Sch. 40 PVC with appropriate fittings except in return air plenums and rated wall penetrations requiring cast iron. All pipes rising in 4-hour rated walls shall be cast iron. (Cellular core "foam core" pipe will not be allowed)

O. Kitchen sink drains: Install Type L copper from each basin- collect and terminate to floor sinks located under fixtures. Refer to details and food service equipment drawings. All copper piping exposed under sinks shall be painted with chrome paint.

P. Cold and hot food counter drains: Install Type L copper from each basin- collect and terminate with ball valve prior to dropping over floor drain. Refer to food service equipment drawings for sizes and connections.

Q. Label ALL piping- flow and direction.

3.3 SERVICE ENTRANCE PIPING

A. Extend water distribution piping and connect to water service piping of size and in location indicated for service entrance to building.

B. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, PRV, inside building at water service entrance.

C. Ductile-Iron Water Service Pipe: Comply with AWWA C600. Install buried pipe inside building between shutoff valve, wall and floor penetrations, and all pipe outside building, with restrained joints, including anchoring pipe to wall or floor. Provide supports (thrust blocks) at vertical and horizontal offsets. Wrap pipe with polyethylene encasement.
D. Extend building storm drain piping and connect to building storm sewer piping of size and in location indicated for service entrance to building. Install cleanout and extension to grade at connection of all building sewer and condensate drains.

E. Extend building sanitary drain piping and connect to sanitary sewer piping of size and in location indicated for service entrance to building. Install cleanout and extension to grade at connection of building sanitary drain and building sanitary sewer.

F. Install sleeve and mechanical sleeve seal at service penetrations through foundation wall for watertight installation.

3.4 DRAINAGE AND VENT PIPING INSTALLATION

A. Install cast-iron soil pipe and cast-iron soil pipe fittings according to CISPI 1990 revised and edited edition of "Cast Iron Soil Pipe and Fittings Handbook, Volume I," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

B. Make changes in direction for drainage and vent piping using appropriate Y branches, Y branches with 1/8 bends, and long-sweep 1/4, 1/5, 1/6, 1/8, and 1/16 bends. Sanitary tees and short-sweep quarter bends may be used on vertical stacks of drainage lines where change in direction of flow is from horizontal to vertical. Use long-turn double-Y-branch and 1/8-bend fittings where 2 fixtures are installed back to back or side by side and have a common drain. Straight tees, elbows, and crosses may be used on vent lines. Make no change in direction of flow greater than 90 degrees. Where different sizes of drainage pipes and fittings are connected, use proper size standard increasers and reducers. Reduction of the size of drainage piping in the direction of flow is prohibited. Lay buried building drains beginning at low point of each system, true to grades and alignment indicated, with unbroken continuity of invert. Place hub or bell ends of piping facing upstream. Install required gaskets according to manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Maintain swab or drag in piping and pull past each joint as completed.

C. Install drainage and vent piping at the following minimum slopes, except where another slope is indicated:

D. Sanitary Building Drain: 1/4 inch per foot (2 percent) for piping 3 inches and smaller; 1/8 inch per foot (1 percent) for piping 4 inches and larger.

E. Horizontal Sanitary Drainage Piping: 1/4 inch per foot (2 percent).

F. Vent Piping: 1/8 inch per foot (1 percent).

G. Sleeves are not required for cast-iron soil pipes passing through concrete slab, without membrane waterproofing, on grade.

3.5 JOINT CONSTRUCTION

A. Basic piping joint construction is specified in Division 22 Section "Basic Mechanical Materials and Methods."

B. Cast-Iron Soil Pipe and Cast-Iron Soil Pipe Fitting Joints: Make joints according to recommendations in CISPI 1990 revised and edited edition of "Cast Iron Soil Pipe and Fittings Handbook, Volume I," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

C. Compression Joint: Make with neoprene gasket matching class of pipe and fittings.

D. Hubless Joint: Make with neoprene gasket and sleeve or clamp.

3.6 FIELD QUALITY CONTROL

A. Inspect water distribution piping as follows:

B. Do not enclose, cover, or put into operation water distribution piping system until it has been inspected and approved by the authority having jurisdiction.

C. During progress of the installation, notify the plumbing official having jurisdiction at least 24 hours prior to time inspection must be made. Perform tests specified below in presence of the plumbing official.

D. Roughing-In Inspection: Arrange for inspection of piping system before concealed or closed-in after system roughing-in and prior to setting fixtures.

E. Final Inspection: Arrange for final inspection by plumbing official to observe tests specified below and to ensure compliance with requirements of plumbing code.

F. Reinspections: When a plumbing official finds that piping system will not pass test or inspection, make required corrections and arrange for reinspection by the plumbing official.

G. Test water distribution piping as follows:

H. Test for leaks and defects in new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of system tested.

I. Leave uncovered and unconcealed in new, altered, extended, or replaced water distribution piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved for testing.

J. Cap and subject the piping system to a static water pressure of 50 psig above the operating pressure without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.

K. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.

L. Inspect drainage piping as follows:

M. Do not enclose, cover, or put into operation drainage and vent piping system until it has been inspected and approved by the authority having jurisdiction.

N. During progress of installation, notify the plumbing official having jurisdiction at least 24 hours prior to time such inspection must be made. Perform tests specified below in presence of the plumbing official.

O. Roughing-In Inspection: Arrange for inspection of piping system after system roughing-in, before concealing, and prior to setting fixtures.

P. Final Inspection: Arrange for final inspection by plumbing official to observe tests specified below and to ensure compliance with requirements of plumbing code.

Q. Reinspections: Make required corrections and arrange for reinspection by plumbing official when piping system fails to pass test or inspection.

R. Drainage and Vent Piping System Tests: Test drainage and vent systems according to procedures of authority having jurisdiction or, in absence of published procedure, as follows:

S. Test for leaks and defects in new drainage and vent piping systems and parts of existing systems that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.

T. Leave uncovered and unconcealed in new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose for testing work that has been covered or concealed before it has been tested and approved.

U. Rough Plumbing Test Procedure: Except for outside leaders and perforated or open-jointed drain tile, test piping of plumbing drainage and venting systems on completion of roughing-in piping installation. Tightly close all openings in piping system and fill with water to point of overflow, but not less than 10 feet head of water. Water level shall not drop during the period from 15 minutes before inspection starts through completion of inspection. Inspect joints for leaks.

V. Acid waste drainage and vent system (if applicable to the project) comprising pipe, matched fittings, neutralization tanks and adapter fittings shall be from a single source. Installation and testing must be in strict accordance to mfg. recommendations and local plumbing codes.

W. Neutralization tank (If shown or noted on the drawings) shall be installed with extension (or separate vault) and cast iron top to withstand tractors and other yard mowing equipment. Top shall be flush with grade. Fill with mfg. provided agent and water. Extend tank vent up in building wall to roof.

X. Special Testing: Refer to Specifications 23 05 00 for special testing below (flush & sewer camera) and above grade (smoke vent testing).

3.7 CLEANING

A. Clean and disinfect water distribution piping as follows:

B. Purge new potable water distribution piping systems and parts of existing potable water systems that have been altered, extended, or repaired prior to use.

C. Samples should be submitted to an independent laboratory and be certified as meeting the standards or regulations of the public health authority having jurisdiction.

D. Flush piping system with clean, potable water until dirty water does not appear at outlets.

E. Submit water samples in sterile bottles to authority having jurisdiction. Repeat procedure if biological examination made by the authority shows evidence of contamination.

F. Prepare and submit reports for purging and disinfecting activities.

G. Clean interior of piping system. Remove dirt and debris as work progresses.

3.8 PROTECTION

Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

END OF SECTION 22 10 00

SECTION 22 11 19 - PLUMBING SPECIALTIES

PART 1 - GENERAL

1. RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

2. SYSTEM PERFORMANCE REQUIREMENTS

Provide components and installation capable of producing piping systems with following minimum working pressure ratings, except where otherwise indicated:

Water Distribution Systems, Below Ground: 150 psig.
Water Distribution Systems, Above Ground: 125 psig.
Soil, Waste, and Vent Systems: 10-foot head of water.
Storm Drainage Systems: 10-foot head of water.

3. SUBMITTALS

Submit product data including rated capacities of selected models and weights (shipping, installation, and operation). Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Water Meters:
- Hersey Products, Inc., Grinnell Corp.
- Submeter Solutions
- Water Watch Corp

Backflow Preventers:
- Conbraco Industries, Inc.
- Febco.
- Hersey Products, Inc., Grinnell Corp. Watts Regulator Co.

Water Pressure Regulators:
- Cash by A.W. Cash Valve Mfg. Corp.
- Conbraco Industries, Inc.
- Spence Engineering Co., Inc.
- Watts Regulator Co.
- Wilkins Regulator Div., Zurn Industries, Inc.

Thermostatic Water-Mixing Valves:
- Lawler Manufacturing Co., Inc.
- Leonard Valve Co.
- Powers Process Controls Unit, Mark Controls Corp.
- Symmons Industries, Inc.

Wall Hydrants:

- Jones Manufacturing Co., Inc.
- Josam Co.
- MiFab
- Smith by Jay R. Smith Mfg. Co. Div., Smith Industries,Inc.
- Wade Div., Tyler Pipe.
- Watts Regulator Co.
- Woodford Manufacturing Co. Div., WCM Industries, Inc.
- Zurn by Hydromechanics Div., Zurn Industries, Inc.

Water Hammer Arresters:

- Amtrol, Inc.
- Jones Manufacturing Co., Inc.
- Josam Co.
- MiFab
- Precision Plumbing Products, Inc.
- Smith by Jay R. Smith Mfg. Co.
- Div., Smith Industries, Inc.
- Sioux Chief Manufacturing Co., Inc.

Trap Seal Primer Valves:

- Jones Manufacturing Co., Inc.
- Josam Co.
- MiFab
- Smith by Jay R. Smith Mfg. Co.
- Div., Smith Industries,Inc.
- Wade Div., Tyler Pipe.
- Watts Regulator Co.
- Zurn by Hydromechanics Div., Zurn Industries, Inc.

2.2 WATER METERS

A. General: Register in gallons, except where registration in cubic feet is indicated.

B. Water Meters: Interior water meters for sub-metering shall have pulse output to allow remote monitoring and data collection by the BMS system- Bacnet- data collection to be in gallons. If main water meter for the facility is NOT compatible, provide meter downstream of the main shutoff valve and PRV assembly. PC shall include time to coordinate with BMS to assure proper setup. Also include training. The kitchen area piping may be sub-metered for cost allocation- consult drawings if this is applicable.

2.3 BACKFLOW PREVENTERS

A. General: ASSE Standard, backflow preventers, of size indicated for maximum flow rate indicated and maximum pressure loss indicated.. Consult county for approved models and required accessories prior to bidding. .

B. Working Pressure: 150 psig minimum except where indicated otherwise.

C. 2 Inches and Smaller: Watts Model 009-QT, bronze body with threaded ends.

D. 2-1/2 Inches and Larger: Watts Model 909S, with strainer.
E. Interior Lining: FDA-approved epoxy coating. Exterior Finish: Epoxy coated.

F. Hose Connection Vacuum Breakers: Woodford Model 34H, ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7 garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

G. Reduced Pressure Zone Backflow Prevention Assemblies: ASSE 1013, consisting of shutoff valves on inlet and outlet and strainer on inlet. Include test cocks with 2 positive-seating check valves for continuous pressure application.

H. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.

2.4 WATER PRESSURE REGULATORS

A. General: ASSE 1003, water pressure regulators, rated for initial working pressure of 150 psig minimum, of size, flow rate, and inlet and outlet pressures indicated. Include integral factory-installed or separate field-installed Y type strainer.
B. 2 Inches and Smaller: Watts Model U5B, bronze body with threaded ends.

C. 2-1/2 Inches and Larger: Watts N223F, bronze body with flanged ends.

D. Interior Lining: FDA-approved epoxy coating, for regulators with a cast-iron body.

E. Interior Components: Corrosion-resistant materials.
F. Single-seated, direct-operated type.

2.5 THERMOSTATIC WATER-MIXING VALVES

A. General: ASSE 1017, manually adjustable, thermostatic water-mixing valve with bronze body. Include checkstop and union on hot-water and cold-water supply inlets, adjustable temperature setting, and capacity at pressure loss as indicated. (Valves designed to accurately distribute high/low flows.) Carefully follow manufacturer's guidelines for proper installation and adjustments. Contractor shall have factory authorized representative provide start-up and testing. Include report in O&M manual.

B. Operation and Pressure Rating: Bimetal thermostat, 125 psig minimum.

C. Thermostatic Water-Mixing Valves: Unit, with options as indicated.
   a. Piping, of sizes and in arrangement, with valves and unions indicated.
   b. Piping Component Finish: Bronze.
   c. Thermometer.

2.6 MISCELLANEOUS PIPING SPECIALTIES

A. Hose Bibbs: Woodford Model 24P/B24P, bronze body, with renewable composition disc, 1/2-inch solder-joint inlet. Provide ASME B1.20.7 garden-hose threads on outlet and integral or field-installed, non-removable, drainable, hose-connection vacuum breaker.

B. Finish: Chrome plated.

C. Operation: Operating key. Provide 1 operating key.

D. Wall Hydrants: Woodford Model B67C, ASSE 1019, nonfreeze, automatic draining, backflow preventer, key operation, with 3/4- inch threaded or solder-joint inlet, and ASME B1.20.7 garden-hose threads on outlet. Provide 1 operating key. Locate such that 100' hose will reach as exterior building areas.

E. Type: Recessed.

F. Finish: Nickel bronze.

G. Can Wash: Woodford Model HCB67, ASSE1019-B, non-freeze, automatic draining, two independent check valves, loose key, 3/4 inch threaded nozzle. Provide 1 operating key and 48" hose. Coordinate with General Contractor to install during brickwork.

H. Type: Recessed.
I. Finish: Nickel bronze.

J. Water Hammer Arresters: Smith Series 5000, PDI WH-201, bellows type with pressurized cushioning chamber. Sizes are based on water-supply fixture units, PDI WH-201 sizes "A" through "F."Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:

K. 125-psig minimum working pressure.
L. Bronze body with atmospheric-vented drain chamber.
M. Inlet and Outlet Connections: 1/2-inch threaded, union, or solder joint.
N. Gravity Drain Outlet Connection: 1/2-inch threaded or solder joint.
O. Finish: Rough bronze.
P. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and set-screws to secure to vent pipe.

Q. Provide access doors (piano hinge type) for all WHA and valves in walls or above hard ceilings. Doors shall be fire rated if needed. Provide lock for all exposed doors. Locate above lay-in ceiling when possible.

2.7 CLEANOUTS

A. General: Size cleanouts as indicated on drawings, or where not indicated, same size as connected drainage piping. Cleanouts larger than 4 inches are not required except where indicated.

B. Cleanouts: ASME A112.36.2M, cast-iron body with straight threads and gasket seal or taper threads for plug, flashing flange and clamping ring, and a brass closure plug. Cleanouts for installation in floors not having membrane waterproofing may be furnished without clamping ring. See Product Data Sheet for deck plate shape, top-loading classification, access cover, finish, and other specific features.

2.8 FLOOR DRAINS

A. General: Size outlets as indicated on Product Data Sheet or drawings.

B. Floor Drains: ASME A112.21.1M, cast-iron body, with seepage flange and clamping device. Floor drains for installation in floors not having membrane waterproofing may have seepage flange without clamping device. Floor drains for use as area drains in exterior slab on grade may be furnished with anchor flange instead of seepage flange and clamping device. See Product Data Sheet at end of Part 3 of this Section for shape, dimensions, strainer and body top finish, top-loading classification, sump size, and specific features. Contact local authority to determine if dumpster pad drain is required. Provide and install in strict accordance.

C. Floor Sinks shall have acid resistant interior with stainless steel dome strainer except for can wash which shall have stainless steel basket strainer. Tops shall be cut to match drain discharge and minimize splattering.

D. Deep Seal Traps: Cast iron or bronze, with inlet and outlet matching connected piping, cleanout where indicated, and trap seal primer valve connection where indicated.

E. 2-Inch Size: 4-inch-minimum water seal.

F. 2-1/2 Inches and Larger: 5-inch-minimum water seal.

G. See food service/kitchen drawings and specifications for requirements of equipment in kitchen. P.C. is responsible for assembly, mounting, and connection of ALL kitchen plumbing equipment (faucets, drains, etc.) The food service drawings may require additional work by the PC. PC shall meet with the KEC on-site and pull a tape to verify all floor drain, floor sink, underground piping risers, etc. PRIOR TO pouring the concrete slab.

2.9 PLASTER TRAPS: Provide Smith, Josam, Wade, or approved equal plaster trap for all ART Classroom sinks. Trap shall have easily removable top- arrange piping for easy access- coordinate with casework prior to fabrication.

2.10 GREASE TRAPS: (Applicable to buildings with commercial kitchens or if noted on the plans) Provide Stay-Right Precast, Green Turtle, or approved equal below grade interceptor designed for kitchen grease waste. Interceptors must meet requirements of the local AHJ- also the installation must comply. Manhole rings shall be sealed gas tight- lids must have the word "Grease" cast into them. Interceptor shall be H-20 traffic rated and/or installed with appropriate concrete slab protection to achieve the rating. Extend vents, cleanouts, etc. as necessary for the AHJ. Sizing shall be as per the AHJ- ____ gallons minimum. Refer to drawings for additional information or if this is applicable.

2.11 ROOF DRAINS

A. General: Size outlet as indicated on Product Data Sheet or drawings.

B. Roof Drains: ASME A112.21.2M, cast-iron body, with combination flashing ring and gravel stop, cast-iron or aluminum dome, extension collars, underdeck clamp, and sump receiver. Roof drains for installation in cast-in-place concrete decks may be furnished without underdeck clamp and sump receiver. Provide steel support under all roof openings as required in the architect/structural drawings. Emergency Overflow Drains shall be the same except shall extension ring. Do not locate closer than 8'-0" from roof edge to prevent falling danger.

C. FLASHING MATERIALS

D. Lead: ASTM B 749, Type L51121, copper-bearing sheet, at least 4 psf (0.0625-inch thick) for general use.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION INSTRUCTIONS:

A. Provide wall cleanouts (floor cleanouts not permitted) at the base of all rainwater and condensate drain lines. Coordinate exact location of drain lines with M.C. Provide grade cleanouts 4'-0" outside the building for all sanitary lines and every 80 feet as required by code.
B. Extend rainwater lines a minimum of 5' beyond the building. G.C. to collect the RW lines. Coordinate inverts and locations prior to construction. Extend condensate drain lines to nearest catch basin/yard inlet unless otherwise shown on the site utility drawing to be collected by the G.C. PC to make final connections to all exterior piping.

C. Consult the architectural kitchen drawings for exact plumbing requirements – floor drains, floor sinks, locations, sizes, etc. All water lines must extend under the floor, type K, and no joints. Label piping.

D. Submit all water meters and backflow preventers to local AHJ for approval prior to ordering.

3.2 INSTALLATION OF WATER METER AND BACKFLOW PREVENTER:

A. Install devices and vaults according to utility company's written installation instructions and requirements. Drain vaults full size to storm system.

B. Size meter and arrange piping and specialties to comply with utility company's requirements.

C. Set meter on 3000-psi minimum, Portland cement mix concrete pad.

D. Disregard if work is shown on Civil Drawings.

3.3 PIPING SPECIALTY INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated, at each water supply connection to mechanical equipment and systems, and to other equipment and systems as indicated. Comply with plumbing code and authority having jurisdiction. Locate in same room as equipment being connected. Install air-gap fitting on units having atmospheric vent connection and pipe relief outlet drain to nearest floor drain. Do not install bypass around backflow preventer.

B. Install pressure-regulating valves with inlet and outlet shutoff valves and balance cock bypass. Install pressure gage on valve outlet and install valved bypass where indicated. Install hose bibbs with integral or field-installed vacuum breaker.

C. Install wall hydrants with integral or field-installed vacuum breaker.

D. Install trap seal primer valves with valve outlet piping pitched down toward drain trap a minimum of 1/8 inch per foot (1 percent) and connect to floor drain body, trap, or inlet fitting. Adjust valve for proper flow. Provide if local authority will not allow hose bibs. Provide for each floor drain.

E. Install cleanouts in above-ground piping and building drain piping as indicated, and where not indicated, according to the following:

F. Size same as drainage piping up to 4-inch size. Use 4-inch size for larger drainage piping except where larger size cleanout is indicated.

G. Locate at each change in direction of piping greater than 45 degrees.

H. Locate at minimum intervals of 50 feet for piping 4 inches and smaller and 75 feet for larger piping.

I. Locate at base of each vertical soil or waste stack. Install cleanout deck plates (covers), of types indicated, with top flush with finished floor, for floor cleanouts for piping below floors.

J. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.

K. Install flashing flange and clamping device with each stack and cleanout passing through floors having waterproof membrane. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to the manufacturer's written instructions.

L. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

3.4 FLOOR DRAIN INSTALLATION

A. Install floor drains according to manufacturer's written instructions, in locations indicated.

B. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.

C. Set drain elevation depressed below finished slab elevation as listed below to provide proper floor slope to drain:

D. Trap drains connected to sanitary building drain. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

E. Position drains for easy accessibility and maintenance.

3.5 ROOF DRAIN INSTALLATION

A. Install roof drains at low points of roof areas, according to the roof membrane manufacturer's installation instructions.

B. Install drain flashing collar or flange so no leakage occurs between roof drain and adjoining roofing. Maintain integrity of waterproof membranes, where penetrated. Install cleanouts at base of all risers, as shown on drawings, and as required by Code.

C. Position roof drains for easy accessibility and maintenance. Coordinate insulation with General Contractor and structural drawings to assure installation in low points and to avoid joists.

3.6 FLASHING INSTALLATION

A. Provide flashing manufactured in a single piece except where large pans, sumps, or other drainage shapes are required.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with membrane waterproofing.

C. Pipe Flashing: Sleeve type, matching pipe size, with minimum sleeve length of 10 inches, and skirt or flange extending at least 8 inches around pipe.

D. Set flashing on floors and roofs in solid coating of bituminous cement.

E. Secure flashing into sleeve and specialty clamping ring or device.

CLEANOUT SCHEDULE

LOCATION	JOSAM MODEL NO.	COVER	TAPERED BRASS PLUG	16"X16"X4" CONCRETE PAD
Wall	58710-22	Stainless	Y	N
Walks or Paving	56050-22	Ductile Iron	Y	Y
Soil	58500-22	Ductile Iron	Y	Y
Finished Floor	56020-22	Nikaloy	Y	N
Exposed	58510	N	Y	N

FLOOR DRAIN SCHEDULE

LOCATION	JOSAM MODEL NO.	TOP	ADJUSTABLE STRAINER
General	30000A	Nikaloy	6"x 6" sq.top

Mechanical	30000	Nikaloy	6"x 6" sq.top

ROOF DRAIN SCHEDULE

JOSAM MODEL NO.	TOP	INTERNAL STRAINER
21500	Cast iron	yes

If schedule is shown on the plumbing drawings, comply with the drawings.

END OF SECTION 22 11 19

SECTION 22 11 23 – PLUMBING PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

This Section includes the following types of plumbing pumps. Refer to pump schedule at end of this section.
Booster pumps.

1.3 SUBMITTALS

Product data including certified performance curves, weights (shipping, installed, and operating), furnished specialties, and accessories, plus installation and start-up instructions.

1.4 QUALITY ASSURANCE

A. National Electrical Code Compliance: Components shall comply with NFPA 70 "National Electrical Code."

B. UL Compliance: Plumbing pumps shall be listed and labeled by UL and comply UL Standard 778 "Motor Operated Water Pumps."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Products: Subject to compliance with requirements, provide one of the following:

Recirculating Pumps:
Armstrong Pumps, Inc.
Bell & Gosset, ITT.
Patterson
Taco, Inc.

Elevator Sump Pumps:
Hydromatic
Liberty
Stancor
Zoeller

2.2 PUMPS, GENERAL

A. Pumps and circulators: factory assembled and factory tested.

B. Motors: Conform to NEMA standards; single, multiple, or variable speed with type of enclosure and electrical characteristics as indicated; have built-in thermal-overload protection and grease-lubricated ball bearings. Select motors that are nonoverloading within the full range of the pump performance curve.

C. Apply factory finish paint to assembled, tested units prior to shipping.

2.3RECIRCULATING PUMPS:

A. The pumps shall be a wet rotor inline pump, lead free bronze body construction specifically designed for quiet operation. Suitable standard operations at 230° F and 175 PSIG working pressure. The pump internals shall be capable of being serviced without disturbing piping connections.

B. Pump shall be equipped with a water-tight seal to prevent leakage. The connection style on the cast iron and bronze pumps shall be flanged.
C. Motor shall be a synchronous, permanent-magnet (PM) motor and tested with the pump as one unit. Conventional induction motors will not be acceptable. Each motor shall have an Integrated Variable Frequency Drive tested as one unit by the manufacturer. Integrated motor protection shall be verified by UL to protect the pump against over/under voltage, over temperature of motor and/or electronics, over current, locked rotor and dry run (no load condition).

D. Pumps shall have MODBUS or BACnet connections built into the VFD as standard options. Analog inputs, such as 0-10V and 4-20mA, are standard inputs built into the VFD. Pumps shall be UL 778 listed and bear the UL Listed Mark for USA and Canada with on-board thermal overload protection.

2.4 ELEVATOR SUMP PUMP:

A. The contractor shall furnish and install a complete simplex/duplex (refer to drawings) pump and oil-sensing control system for each elevator sump, as shown on the drawings. The pumping system shall be capable of pumping water while containing oil. The system shall function automatically and shall provide local visual LED indicator lights for EACH of the following events a) the presence of oil in the sump when the pump is signaled to run, b) high liquid in the sump, c) high amps or a locked rotor motor condition, d) electrical power to the panel and e) pump activation.

B. An alarm that occurs only in the event of a high liquid level condition and/or oil detected in the pit
C. shall not be considered equal and will not be accepted. Provide dry contacts for remote monitoring of oil detected, high water/sump level alarm/motor overload. The Oil Monitoring Control System shall have a minimum of 10 years of proven reliability. Locate remote alarm panel in a corridor or space as agreed upon by the local AHJ. Provide additional cabling as required.

D. The sump pump(s) shall be heavy duty submersible type, each capable of pumping 50 GPM @ 20' TDH. The motor shall be rated 1/2 H.P., 1 phase, 60 hertz, 115 or 230 volt, and shall be capable of operating continuously or intermittently and shall include thermal and overload protection. The pump discharge shall have a minimum discharge connection size of 2". The motor housing and fastening bolts shall be constructed of 304 Stainless Steel and the mechanical seals shall be housed in a separate oil-filled compartment. The pump shall have a semi-open non-clogging vortex impeller, and shall be designed for floor mounting complete with support legs.

E. The high level liquid alarm is enabled by an additional float (high level alarm float / lag pump start float) placed at a level in the pit above normal acceptable liquid levels. The rising of this float (closing) will cause the controller to energize the audible alarm, remote alarm relay, and the high level LED.

F. A clearly marked terminal board with unpowered remote monitoring contacts for connection to the RMS shall be included as standard. Provide factory hard wiring of pump, oil probe and floats into the NEMA 4X control box.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with the manufacturer's written installation and alignment instructions.

B. Install pumps in locations and arrange to provide access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.

C. Suspend inline pumps with all thread hanger rod and vibration isolation hangers of sufficient size to support the weight of the pump independent from the piping system.

D. Lubricate oil-lubricated bearings.

E. Do not trim impeller- HWC pump only.

F. Install PT ports (Pete's Plugs) on entering and leaving side of all pumps and the water heater.

G. Test all pumps and include in T&B.

PUMP SCHEDULE- See drawings. Install aquastats to interrupt circulating pump operation when temperature exceeds setpoint. Coordinate with mechanical contractor to connect to building DDC system.

END OF SECTION 22 11 23

SECTION 22 34 00 – GAS WATER HEATERS

PART 1 - GENERAL

1.1 QUALITY ASSURANCE:

Codes and Standards:

UL Label: Provide water heater listed and labeled by Underwriter's Laboratories and National Sanitation Foundation.

ASHRAE Compliance: Provide water heater with Performance Efficiency not less than prescribed in ASHRAE 90A, "Energy Conservation in New building Design".

AGA: All gas burning appliances shall be AGA certified.

1.2 DELIVERY, STORAGE, AND HANDLING:

Handle water heater and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged water heater or components; remove from site and replace with new.

1.3 HEATER WARRANTY: The burner and all heater parts will have a one year warranty. Storage tank, heating surfaces and combustion chamber will have a 10 year warranty covering manufacturing or material defects, leaks, and /or the production of rusty water. Warranty period shall begin from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GAS WATER HEATER:

1. Manufacturers: Subject to compliance with requirements, provide commercial water heaters of one of the following:

    a. Lochinvar
    b. PVI
    c. Smith Corp. (A.O.); Consumer Products Div.

2. The water heater shall have a modulating input rating and recovery capacity in gallons per hour at a 100oF rise as per the schedule on the drawings. The fuel source shall be Natural Gas- PC shall confirm with the utility company prior to ordering that natural gas will be available during the project schedule- if not, provide LP with the natural gas conversion kit. The water heater shall be capable of full modulation firing down to 20% of rated input with a turn down ratio of 5:1.

3. The water heater shall bear the ASME "HLW" stamp and shall be National Board listed for inputs in excess of 200,000 Btu/Hr. There shall be no banding material, bolts, gaskets or "O" rings in the header configuration. The stainless steel combustion chamber shall be designed to drain condensation to the bottom of the heat exchanger assembly. A built-in trap shall allow condensation to drain from the heat exchanger assembly. The complete heat exchanger assembly shall carry a five (5) year limited warranty.

4. The water heater shall be certified and listed by C.S.A. International under the latest edition of the harmonized ANSI Z21.10.3 test standard for the US and Canada The water heater shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard. The water heater shall be AHRI certified to 96% thermal efficiency. The water heater

shall be certified for indoor installation. Coordinate with EC to have a carbon monoxide sensor (part of the fire alarm system) installed in all rooms with gas fired water heaters.

5. The water heater shall be constructed with a heavy gauge steel jacket assembly, primed and pre-painted on both sides. The combustion chamber shall be sealed and completely enclosed, independent of the outer jacket assembly, so that integrity of the outer jacket does not affect a proper seal. A burner/flame observation port shall be provided. The burner shall be a premix design and constructed of high temperature stainless steel with a woven metal fiber outer covering to provide modulating firing rates. The water heater shall be supplied with a gas valve designed with negative pressure regulation and be equipped with a variable speed blower system, to precisely control the fuel/air mixture to provide modulating water heater firing rates for maximum efficiency. The water heater shall operate in a safe condition at a derated output with gas supply pressures as low as 4 inches of water column.

6. The water heater shall utilize a 24 VAC control circuit and components. The control system shall have an electronic display for water heater set-up, water heater status, and water heater diagnostics. All components shall be easily accessed and serviceable from the front and top of the jacket. The water heater shall be equipped with; a high limit temperature control certified to UL353, ASME certified pressure relief valve, outlet water temperature sensor, inlet water temperature sensor, a UL 353 certified flue temperature sensor, low water flow protection and built-in freeze protection. The manufacturer shall verify proper operation of the burner, all controls and the heat exchanger by connection to water and venting for a factory fire test prior to shipping.

7. The water heater shall feature the "Smart System" control with a Multi-Colored Graphic LCD display with Navigation Dial and Soft Keys, password security, pump delay with freeze protection, pump exercise, and USB PC port connection. The water heater shall feature night setback for the domestic hot water tank and shall be capable of controlling a building recirculation pump while utilizing the night setback schedule for the building recirculation pump. The water heater shall have the capability to accept a 0-10 VDC input connection for BMS control of modulation or setpoint and enable/disable of the water heater, and a 0-10VDC output of water heater modulation rate. The water heater shall have a built-in cascading sequencer with modulation logic options of "lead lag" or "efficiency optimized". Both modulation logic options should be capable of rotation while maintaining modulation of up to eight water heaters without utilization of an external controller. Supply voltage shall be 120 volt / 60 hertz / single phase.

8. The water heater shall be equipped with two terminal strips for electrical connection. A low voltage connection board with data points for safety and operating controls, i.e., Auxiliary Relay, Auxiliary Proving Switch, Alarm Contacts, Runtime Contacts, Manual Reset Low Water Cutoff, Flow Switch, High and Low Gas Pressure Switches, Tank Thermostat, Tank Sensor, Building Management System Signal, Modbus Control Contacts and Cascade Control Circuit. A high voltage terminal strip shall be provided for supply voltage. The high voltage terminal strip plus integral relays are provided for independent control of the Domestic Hot Water Pump and Building Re-circulation Pump.

    a. The water heater shall be capable of being installed and vented with either:

        (a) Direct Vent Sidewall system with a horizontal sidewall termination of both the vent and combustion air. The flue shall be AL294C Stainless Steel sealed vent material terminating at the sidewall with the manufacturers specified vent termination. A separate pipe shall supply combustion air directly to the water heater from the outside. The air inlet pipe shall be Galvanized or Stainless Steel sealed pipe. The air inlet must terminate on the same sidewall with the manufacturer's specified air inlet cap. The water heater total combined air intake length shall not exceed 100 equivalent feet. The water heater total combined exhaust venting length shall not exceed 100 equivalent feet.

(b) Direct Vent Vertical system with a vertical roof top termination of both the vent and combustion air. The flue shall be AL294C Stainless Steel sealed vent material terminating at the roof top with the manufacturers specified vent termination. A separate pipe shall supply combustion air directly to the water heater from the outside. The air inlet pipe shall be Galvanized or Stainless Steel sealed pipe. The air inlet must terminate on the roof top with the manufacturer's specified air inlet cap. The water heater total combined air intake length shall not exceed 100 equivalent feet. The water heater total combined exhaust venting length shall not exceed 100 equivalent feet.

b. The water heater shall have an independent laboratory rating for Oxides of Nitrogen (NO_x) of 20 ppm or less, corrected to 3% O_2.

c. The water heater shall operate at altitudes up to 4,500 feet above sea level without additional parts or adjustments.

d. The water heater firing control system shall be Direct Spark Ignition with Electronic Supervision

2.3 EXPANSION TANKS

A. Description: Steel, ASME pressure-rated tank constructed with welded joints and factory-installed, butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

B. Construction: `150-psig` working-pressure rating. ASME constructed vessel designed to absorb the forces of expanding water and protect the domestic water system from pressure build up. Diaphragm type tanks with an FDA approved polypropylene liner and butyl diaphragm that isolate the water from the steel shell.

C. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1, pipe thread.

D. Tank Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.

E. Tank Exterior Finish: Manufacturer's standard.

F. Air-Charging Valve: Factory installed.

PART 3 - EXECUTION

3.1 INSTALLATION GENERAL:

Plumbing Contractor shall be responsible for installing the flue for the water heater. Flue shall be AL294C. Mfg. must meet or exceed both storage and recovery.

3.2INSTALLATION OF WATER HEATER:

A. General: Install water heater in accordance with manufacturer's installation instructions. Install plumb and level and maintain manufacturer's recommended clearances.

B. Support: Place units on support stand, orient so controls and devices needing service and maintenance have adequate access.

C. Piping: Connect hot and cold water piping to unit with shutoff valve check valve and unions. Extend relief valve discharge to floor drain.

D. NOTE: DOMESTIC WATER STORAGE TANK & HEATER MUST USE STAINLESS STEEL FITTINGS OR BRASS. (Galvanized or cast iron is not permitted.)

3.3 FIELD QUALITY CONTROL:

Start-Up: Start-up, test, and adjust water heater in accordance with manufacturer's start-up instructions, and utility company's requirements. Check and calibrate controls to supply proper water temperature. Factory start-up and Owner training is required.

END OF SECTION 22 34 00

SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and all bound Specification Sections, apply to this Section.

1.2 SUBMITTALS

Product data for each type of plumbing fixture specified, including fixture and trim, fittings, accessories, appliances, appurtenances, equipment, supports, construction details, dimensions of components, and finishes.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements of ANSI Standard A117.1, "Buildings and Facilities--Providing Accessibility and Useability for Physically Handicapped People," and Public Law 90-480, "Architectural Barriers Act," with respect to plumbing fixtures for the physically handicapped.

B. Design Concept: The drawings indicate types of plumbing fixtures and are based on the specific descriptions, manufacturers, models, and numbers indicated. Plumbing fixtures having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions, operation, color or finish, or other characteristics are minor and do not change the design concept or intended performance as judged by the Architect. Burden of proof for equality of plumbing fixtures is on the proposer.

C. Installation Mock-up Requirements: Provide actual mock-up of water closet installation (for wall hung fixtures- potential conflict to obtain required fixture height- also potential conflict with grab bars and flush valve) to demonstrate to Owner, Engineer, and Local Inspector that fixture mounting heights can be met prior to release of carriers/fixtures. Mounting heights and rough-in locations are critical. Remove tabs from carriers, etc. as necessary to match mounting heights shown on architectural drawings. All fixtures will be measured by the local inspector. All deviations will be corrected. Off-set closet flange will not be permitted for floor mounted closets. Change ADA grab bars to split grab bars if necessary to allow service and access to the flush valve.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products in each category, by one of the following listed for that category:

Water Closets:
American Standard, Inc.
Eljer; A Household International Co.
Kohler Co.

Urinals:
American Standard, Inc.
Eljer; A Household International Co.
Kohler Co.

Lavatories:

American Standard, Inc.
Eljer; A Household International Co.
Kohler Co.

Service Sinks:
American Standard, Inc.
Eljer; A Household International Co.
Kohler Co.

Sinks:
American Standard, Inc.
Elkay Manufacturing Co.
Just Mfg. Co.
Kohler Co.

Showers:
Acorn Engineering Co.
American Standard, Inc.
Bradley Corp.
Crane Plumbing/Fiat Products.
Eljer; A Household International Co.
Kohler Co.

Water Coolers:
EBCO Manufacturing Co. (Oasis)
Halsey Taylor
Haws Drinking Faucet Co.
Sunroc Corp.

Toilet Seats:
Bemis Mfg. Co.
Beneke Div.; Sanderson Plumbing Products, Inc.
Church Seat Co.
Kohler Co.
Olsonite Corp.

Flush valves:
Sloan Valve Co.
Delany Flush Valves
Zurn

Commercial/Industrial Cast-Brass Faucets:
American Standard, Inc.
Chicago Faucet Co.
Eljer; A Household International Co.
Kohler Co.
T & S Brass and Bronze Works, Inc.
Symmons

Supports:
Josam Co.
Smith (Jay R.) Mfg. Co.
Wade Div.; Tyler Pipe.
Zurn Industries, Inc.; Hydromechanics Div.

2.2 PLUMBING FIXTURES, GENERAL

Provide plumbing fixtures and trim, fittings, other components, and supports as specified or shown on the drawings.

2.3 FAUCETS

Faucets General: Unless otherwise specified, provide faucets that are cast brass with polished chrome-plated finish.
ASME A112.18.1M, centerset fitting, heavy duty and l/2-gpm flow control fitting in spout, grid drain. ADA compliant where indicated. All public/student use faucets shall be metering type. All private faucets shall be single lever operation.

Sink Faucet, Staff: ASME A112.18.1M, centerset fitting, single lever handle and swing spout.

Shower Faucet(H): ASME A112.18.1M, cast-brass combination single-lever, pressure-balancing mixing valve (anti-scald) and escutcheon, and handheld shower. Polished chrome-plated finish on all exposed metal. ADA compliant.

2.4 FITTINGS, EXCEPT FAUCETS

Fittings General: Unless otherwise specified, provide fittings fabricated of brass, with a polished chrome plated finish.

Lavatory Supplies and Stops, Type I: Loose-key angle stop, having l/2-inch NPS inlet with wall flange and 3/8-inch by l2-inch long rigid tubing riser outlet.

Lavatory Traps, Type 1: Cast-brass, I-l/4-inch NPS adjustable P-trap with cleanout, I-l/4-inch NPS chrome nipple to wall, and wall flange. Note: Lavatories designated as handicapped shall have sloped drain line to allow wheelchair access if fixture is not designed to allow standard drain and meet ADA requirements.

NOTE: COORDINATE ALL CABINET MOUNTED SINKS WITH CASEWORK APPROVED SUBMITTALS BEFORE RELEASING ORDER- ADJUST BOWL DEPTH AS REQUIRED TO FIT INTO APPROVED CASEWORK AND MAINTAIN ADA CLEARANCES.

Sink Supplies and Stops, Type 1: Loose key angle stop, having 1/2-inch NPS inlet with wall flange and 1/2-inch by 12-inch flexible tubing riser outlet. All exposed sink traps/supplies and all ADA sink traps/supplies shall have mildew resistant, vinyl guards/covers.

Sink Traps, Type 1: Cast-brass, 1-1/2-inch NPS adjustable P-trap with cleanout, 17-gage tubular waste to wall, and wall flange. Sinks designated as handicapped shall have sloped drain line to allow wheelchair access.

Supply and drain plumbing service fittings not listed above shall be as specified and as scheduled.

Fittings installed concealed inside a plumbing fixture or within wall construction may be without chrome plate finish.

Deep Pattern Escutcheons: Wall flange with set screw or sheet steel wall flange with friction clips, of depth adequate to conceal protruding roughing-in fittings.

2.5 FLUSH VALVES:

Provide flush valves compatible with fixtures, with features and of consumption indicated.

Construction: Cast-brass body, brass or copper pipe or tubing inlet with wall flange and tailpiece with spud, screwdriver check stop, vacuum breaker, and brass lever handle actuation except where other variations are specified. Type shall be diaphragm operation except where other type is specified.

Finish: Exposed metal parts shall be polished chrome-plated, except components installed in a concealed location may be rough brass or unfinished.

Water closet flush valves, Type I: Furnish with following features.
Furnish flush valves with factory-set or field-adjusted maximum water consumption per cycle. Flush valves may be diaphragm or piston type.
Consumption: 1.2 gallons per flushing cycle.
Provide cast wall flange, YJ stand-off bracket.

Water closets shall have manual flush valve operator. Provide one rebuild kit per 10 flush valves.

Urinal flush valves, Type I: Furnish with following features. Furnish flush valves with factory-set or field-adjusted maximum water consumption per cycle. Flush valves may be diaphragm or piston type.
Consumption: 0.125 gallons per flushing cycle.
Provide cast wall flange, YJ stand-off bracket.

Urinals shall have manual flush valve operator. Provide one rebuild kit per 10 flush valves.

2.6 TOILET SEATS

General: Provide toilet seats compatible with water closets, and of type, color, and features indicated.

Toilet Seats, Type 1: Heavy-duty, commercial/industrial type, elongated, open front, solid plastic, with check hinge (self-sustaining).

2.7 PLUMBING FIXTURE SUPPORTS

Supports: ASME A112.6.1M, categories and types as required for wall-hanging fixtures specified, and wall reinforcement.

Support categories are:

Chair Carriers: Supports with steel pipe uprights for wall-hanging fixtures. Urinal chair carriers shall have bearing plates.

Reinforcement: 2-inch by 4-inch wood blocking between studs or 1/4-inch by 6-inch steel plates attached to studs, in wall construction, to secure floor-mounted and special fixtures to wall.

PART 3 - EXECUTION

3.1 APPLICATION

A. Install plumbing fixtures and specified components, in accordance with designations and locations indicated on Drawings.

B. Install supports for plumbing fixtures in accordance with categories indicated, and of type required:
C. Carriers for following fixtures:
D. Wall-hanging fixtures supported from wall construction.

E. Chair carriers for the following fixtures:
   1. Wall-hanging lavatories and sinks.
   2. Wall-hanging electric water coolers.

3. Note: Some water closets are wall hung- consult architectural drawings for type and mounting.

3.2 INSTALLATION OF PLUMBING FIXTURES

A. Plumbing contractor shall consult architectural drawings to ensure that fixtures provided will fit into the allocated space and meet the intended use (i.e. ADA compliant, etc.). Flush valve handles for water closets must face the wide side of the partition. P. C. shall replace any flush valves not meeting this requirement. Consult architectural drawings for all mounting heights/locations.

B. Install plumbing fixtures level and plumb, in accordance with fixture manufacturers' written installation instructions, roughing-in drawings, and referenced standards.

C. Install floor-mounted, floor-outlet water closets with closet flanges and gasket seals.

D. Secure supplies behind wall or within wall pipe space, providing rigid installation.

E. Seal fixtures to walls, floors, and counters using a sanitary-type, one-part, mildew-resistant, latex (paintable) sealant.

F. Exposed copper supplies will not be acceptable. Contractor shall take extra care to cut supplies close to conceal copper with escutcheon.

G. ALL KITCHEN SINK DRAINS AND EXPOSED SUPPLIES SHALL BE PAINTED CHROME COLOR.

3.3 FIELD QUALITY CONTROL

Inspect each installed fixture for damage. Replace damaged fixtures and components.

Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

3.4 ADJUSTING AND CLEANING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at electric water coolers, faucets, and flush valves having controls, to provide proper flow and stream.

C. Replace washers of leaking and dripping faucets and stops.

D. Clean fixtures, fittings, and spout and drain strainers with manufacturers' recommended cleaning methods and materials.

3.5 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities, except when approved in writing by the Owner.

C. FIXTURES: See below and the fixture schedule on the drawings.

3.6 HOSE REEL:

Hose reel provided by Food Service Equipment Contractor. Provide check valves in HW and CW piping per plans.

ROUGH-IN SCHEDULE:

FIXTURE	HOT WATER	COLD WATER	WASTE	VENT
Lavatory and sink	1/2"	1/2"	1-1/4"	1-1/2"
Water Closet With FV	-	1"	4"	2"
Urinals	-	3/4"	2"	1-1/2"
Water Cooler	-	1/2"	1-1/4"	1-1/2"

Coordinate all rough-in heights and locations with architectural drawings to avoid conflicts.

END OF SECTION 22 40 00

SECTION 22 51 00 - PLUMBING - BREECHINGS, CHIMNEYS, AND STACKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY:

This Section specifies double wall metal vents and accessories for gas-fired appliances.

1.3 SUBMITTALS:

A. Product Data: Submit product data including materials, dimensions, weights, and accessories.

B. Shop Drawings: Submit shop drawings including required clearances, assembly and installation instructions, and support of components.

C. Quality Control Submittals:

D. Certificates: Submit certificates of materials compliance with specified ASTM, UL, and ASHRAE requirements.

1.4 QUALITY ASSURANCE:

A. Codes and Standards:

B. NFPA: Comply with NFPA 211 "Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances."

PART 2 - PRODUCTS

2.1 DOUBLE WALL METAL VENTS:

A. All Steel, Positive Pressure, Category IV Double Wall Vents:

B. Manufacturers: Subject to compliance with requirements, provide all steel, positive pressure double wall vents of one of the following:
   a. Ampco
   b. Selkirk Metalbestos.
   c. Van Packer
   d. Protech Systems
   e. Stacks, Inc., Div. of Air Management, Inc.
   f. General Products Co., Inc.
   g. Jeremiahs Exhaust Systems

C. Construction: AL29-4C SS inner / 430SS outer, 1" minimum air space between walls. Tested and Listed to UL 1738/ULC S636 for Category 2, 3, & 4 Appliances, Tested and Listed to UL 641/ULC-S609 for L-Vent Gas & Oil Appliances

D. Accessories: UL-labeled tees, elbows, increasers, support assembly, thimbles, and fasteners fabricated of similar materials and designs as vent pipe straight sections.

PART 3 - EXECUTION

3.1 INSTALLATION OF DOUBLE WALL CONNECTORS, AND BREECHINGS:

A. Install all positive pressure, double wall vents in accordance with manufacturer's installation instructions and UL listing. Maintain minimum clearances from combustibles specified in UL listing.

B. Seal joints between sections of positive pressure vents in accordance with manufacturer's installation instructions, and using only sealants recommended by manufacturer.

C. Support vents at intervals recommended by the manufacturer to support the weight of the vent and all accessories, without exceeding loading of appliances.

D. Provide and install barometric damper for each water heater if required by manufacturer.

E. Extend all vents a minimum of 36' above the roof. Locate vents on the "back" side of the roof-coordinate with the architect.

F. Manufacturer must provide sizing calculations of vent size requirement prior to fabrication. Provide local authority and engineer copy of calculations if requested. Do NOT provide smaller size than listed unless prior approval in writing provided by the engineer. Increase size as necessary.

END OF SECTION 22 51 00

SECTION 22 70 00 - NATURAL GAS PIPING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

This Section includes piping, specialties, and accessories for natural gas systems within the building and to the gas meters.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 54 "National Fuel Gas Code" for gas piping materials and components; installations; and inspection, testing, and purging.

B. Comply with NFPA 70 "National Electrical Code" for electrical connections between wiring and electrically operated control devices.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Gas Pressure Regulators:
    a. Fisher Controls.
    b. Jordan Valve Div., Richards Industries, Inc.
    c. Lancaster by National Meter Parts, Inc.
    d. Maxitrol Co.

2. Low-Pressure Gas Stops:
    a. Hammond Valve Corp.
    b. Jomar International, Ltd.
    c. Lancaster by National Meter Parts, Inc.
    d. A.Y. McDonald Mfg. Co.
    e. Rockford-Eclipse Div., Eclipse, Inc.
    f. Gas Valves, 2 Inches and Smaller:
    g. Homestead by Olson Technologies, Inc.
    h. Lancaster by National Meter Parts, Inc.
    i. Lunkenheimer Co.
    j. Mueller Co., A Grinnell Co.
    k. Rockford-Eclipse Div., Eclipse, Inc.

3. Natural Gas Pulse Meters for BMS:
    Provide utility company meter that will produce pulses which can be read and accumulated by the BMS system. If for any reason the utility company cannot or does not provide an acceptable pulse meter, MC shall provide and install just inside the riser room. Coordinate with BMS vendor to get accurate data values and demonstrate for the Commissioning Agent.

2.2 PIPES AND TUBES

Steel Pipe: ASTM A 53, Type E, Electric-Resistance Welded or Type S, Seamless, Grade B, Schedule 40, black.

2.3 PIPE AND TUBE FITTINGS

A. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threads conforming to ASME B1.20.1.

B. Unions: ASME B16.39, Class 150, black malleable iron; female pattern; brass-to-iron seat; ground joint.

2.4 VALVES

A. Manual Valves: Conform to standards listed, or where appropriate, valves according to ANSI Z21.15 and ANSI Z21.15a.

B. Low-Pressure Gas Stops: AGA-certified design for 2 psig or less natural gas, with AGA stamp, plug or ball type, bronze body and bronze plug or chrome-plated brass ball. Include flat head, square head, or lever handle and threaded ends.

C. Option: Include locking (tamperproof) feature.

D. Gas Valves, 2 Inches and Smaller: ASME B16.33, 150 psi WOG, bronze body, bronze plug, straightaway pattern, square head, tapered-plug type, with threaded ends.

E. Option: Include locking (tamperproof) feature.

2.5 PIPING SPECIALTIES

A. Gas Pressure Regulators: ANSI Z21.18 or ANSI Z21.18a, single stage, steel jacketed, corrosion-resistant pressure regulators. Include atmospheric vent, elevation compensator, with threaded ends for 2 inches and smaller and flanged ends for 2-1/2 inches and larger. Regulator pressure ratings, inlet and outlet pressures, and flow volume in standard cubic feet per hour of natural gas at specific gravity are as indicated. Delivery pressure at meter shall be "x" psig. (Consult plan for exact pressure – pressure shall not exceed 5 psig.) All regulators to come with Over Pressure Devices (OPD) in accordance with the NC Fuel Gas Code.

B. Appliance Gas Pressure Regulators: Inlet pressure rating not less than system pressure, with capacity and pressure setting matching appliance.

C. Gas Pressure Regulator Vents: Factory- or field-installed corrosion-resistant screen in opening when not connected to vent piping.

D. Flexible Connectors: ANSI Z21.24 or ANSI Z21.24a, copper alloy. Provide for kitchen equipment and electrical generators – AGA approved. Kitchen flexible connectors shall have smooth PVC jacket. Exterior connectors shall be stainless steel.

E. Strainers: Y pattern, full size of connecting piping. Include Type 304 stainless-steel screens with 3/64-inch perforations except where other screens are indicated.

F. Pressure Rating: 125 psig minimum steam or 175 psig WOG working pressure except where otherwise indicated.

G. Sizes 2 Inches and Smaller:
H. Bronze body, with female threaded ends.

2.6 PROTECTIVE COATING

A. Furnish pipe and fittings with factory-applied, corrosion-resistant polyethylene coating for use in corrosive atmosphere. Coating properties include:

B. Applied to pipe and fittings treated with a compatible primer prior to application of tape.

C. Overall Thickness: 20 mils, synthetic adhesive.

D. Water Vapor Transmission Rate: Maximum 0.10 gallon per 100 square inches.

E. Water Absorption: 0.02 percent maximum.

PART 3 - EXECUTION

3.1 PIPE APPLICATIONS

A. General: Flanges, unions, transition and special fittings, and valves with pressure ratings same or higher than system pressure rating may be used in applications below, except where specified otherwise.

B. Low-Pressure Natural Gas Systems, above Ground within Building: Use the following:
C. 2 Inches and Smaller: Steel pipe, malleable-iron, threaded fittings, and threaded joints.

D. 2-1/2 Inches and Larger: Steel pipe, butt-welding fittings, and welded joints.

E. Medium-Pressure Natural Gas Systems, above Ground within Building (2 psig): Use steel pipe, butt-welding fittings, and welded joints.

3.2 VALVE APPLICATIONS

A. Use low-pressure gas stops, tapered plug or ball type, for shutoff to appliances with 2-inch or smaller low-pressure gas supply.

B. Use gas valves for shutoff to appliances.

3.3 PIPING INSTALLATIONS

A. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for basic piping installation requirements.

B. Paint all gas lines with two (2) coats of yellow paint. Provide permanent pipe markers labeling Natural Gas and the direction of flow. Label every 15 feet and every change of direction.

C. Concealed Locations: Except as specified below, install concealed gas piping in an air-tight conduit constructed of Schedule 40 seamless black steel with welded joints. Vent conduit to the outside and terminate with a screened vent cap. Above-Ceiling Locations: Gas piping may be installed in accessible above-ceiling spaces (subject to approval of the authority having jurisdiction), whether or not such spaces are used as a plenum. Do not locate valves in such spaces. Weld all piping above ceilings used as a plenum. (Weld all piping inside the building on this project – no exceptions.).

D. In Partitions: Do not install concealed piping in solid partitions. This does not apply to tubing passing through partitions or walls.

E. In Walls: Gas piping with welded joints and protective wrapping may be installed in masonry walls (subject to approval of authority having jurisdiction).

F. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of gas meters. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate would be subject to freezing.

G. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum length nipple of 3 pipe diameters, but not less than 3 inches long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.

H. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels, except where indicated to be exposed to view.

I. Tar and wrap all underground gas piping to make watertight (factory installed).

J. Kitchen equipment: Provide flexible stainless steel hose with PVC jacket- NSF and AGA certified. Hose length shall be sufficient to allow shifting the appliance for cleaning and disconnecting. Provide gas ball valve at each origin.

K. Install gas piping at a uniform grade of 1/4 inch in 15 feet, upward toward risers. Install piping upward from service risers to meters, service regulator when meter is not provided, and equipment.

L. Make reductions in pipe sizes using eccentric reducer fittings installed with the level side down.

M. Connect branch piping from top or side of horizontal piping.

N. Install unions in pipes 2 inches and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

O. Install dielectric fittings (unions and flanges) with 1 ferrous and 1 brass or bronze-end connections, separated by insulating material, where piping of dissimilar metals are joined.

P. Install strainers on the supply side of each control valve, gas pressure regulator, solenoid valve, and elsewhere as indicated.

Q. Anchor piping to ensure proper direction of piping expansion and contraction. Install expansion joints, expansion loops, and pipe guides as indicated.

R. Install vent piping for gas pressure regulators and gas trains, extend outside building (above roof), and vent to atmosphere. Terminate vents with turned-down, reducing elbow fittings with corrosion-resistant insect screens in large end. Provide for each piece of equipment.

3.4 VALVE INSTALLATION

A. Install valves in accessible locations, protected from physical damage. Tag valves with a metal tag attached with a metal chain indicating the piping systems supplied.

B. Install a gas valve upstream of each gas pressure regulator. Where two gas pressure regulators are installed in series in a single gas line, a manual valve is not required at the second regulator.

C. Install pressure-relief or pressure-limiting devices so they can be readily operated to determine if valve is free; test to determine pressure at which they will operate; and examine for leakage when in closed position.

D. Extend to all appliances that use natural gas. Provide cutoff valves, dirt legs, pressure test taps on entering and leaving side of regulators, and regulators (verify delivery and end use pressure requirements) for each piece of equipment. Make final connections to all equipment. Pipe off vent from regulator to outside with appropriate mushroom cap or turned down elbow.

E. Provide single line diagram of all gas valve locations and corresponding pipe sizes- install under glass in the boiler room. Provide brass valve tags similar to water piping valves except use letter designations.

3.5 CONNECTIONS

Install gas piping next to gas utilizing equipment and appliances to allow servicing and maintenance. Connect gas piping to gas utilizing equipment and appliances with shutoff valves and unions. Make connections downstream of valves and unions, with flexible connectors where indicated.

3.6 TERMINAL EQUIPMENT CONNECTIONS

A. Install a gas valve upstream and within 6 feet of each gas utilizing appliance. Install a union or flanged connection downstream from the valve to permit removal of controls. Install stainless steel flexible connector and shutoff valve at generator.

B. Sediment Traps: Install tee fittings forming drips, as close as practical to gas appliance inlets. Cap or plug bottom outlet.

3.7 ELECTRICAL BONDING AND GROUNDING

Install above-ground portions of natural gas piping systems that are upstream from equipment shutoff valves, electrically continuous and bonded to a grounding electrode according to NFPA 70. Do not use gas piping as a grounding electrode.
Bond gas piping to steel structure.

3.8 FIELD QUALITY CONTROL

Inspect, test, and purge natural gas systems according to NFPA 54, Part 4 "Gas Piping Inspection, Testing, and Purging" and local gas utility requirements. Repair leaks and defects with new materials, and retest system until satisfactory results are obtained.

3.9 ADJUSTING

Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.

END OF SECTION 22 70 00

DIVISION 23 - MECHANICAL

SECTION 23 05 00 - SUMMARY OF THE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General Conditions and Amendments, Supplementary Conditions, and Affirmative Action Policy for MWBE, and all Sections bound with these specifications shall be considered an integral part of this section.

B. The specifications and drawings shall be considered as supplementary to each other, requiring materials and labor indicated, specified, or implied by either specifications or drawings and shall be supplied and installed as though specifically called for by both.

C. Reference herein to "Engineer" refers to the firm Consultant Engineering Service, Inc. of Winston-Salem, North Carolina.

1.2 REGULATIONS AND CODES:

All work shall conform to the rules and regulations of the North Carolina State Building Code, Mechanical Code, Energy Code, latest edition, NFPA and local inspector having jurisdiction. Should contract documents and these regulations conflict in any area, the regulations and codes shall be followed.

1.3 EXAMINATION OF SITE:

Before submitting a proposal the contractor shall examine the site, familiarize himself with all existing conditions and obtain all information required to enable him to provide a complete and satisfactory installation. The contractor's failure to comply with these requirements will not relieve him of the responsibility of any errors which might have been avoided by his compliance.

1.4 OPENINGS, CUTTING AND PATCHING:

Various openings, cutting, patching and steel lintels will be required for the installation of the mechanical work. Mechanical contractor shall install a steel lintel over every opening l2" and above. Refer to lintel schedule on structural drawings for sizes. All openings shall be framed out prior to construction- refer to structural drawings for requirements. If an opening is missed, the cutting of openings or holes in walls and cutting of holes in floors and ceilings shall be performed in strict accordance to the structural engineer requirements.

1.5 PROTECTION OF EQUIPMENT:

The contractor shall be responsible for all work damaged by him in executing contract. All work damaged by the contractor shall be replaced by him and placed in perfect working condition without extra cost. Any construction work damaged shall be made good. The contractor shall at all times be responsible for any damaged equipment or work in conjunction with executing contract.

1.6 GUARANTEE:

A. General Conditions shall apply to Guarantee and Warranty.

B. All guarantee failures shall be corrected or replaced by contractor as soon as possible after notification of such failure.

C. As a minimum, all work shall be guaranteed for a period of 12 months from the date of final acceptance, labor and material.

D. Compressors, boilers, drives, chillers, and other equipment may carry longer warranty requirements- consult drawings and specifications.

1.7 OPERATING INSTRUCTIONS:

At the completion of the work the contractor shall furnish architects (3) booklets containing engineering data and cuts of all equipment along with typed or printed operating instructions. Booklets shall be subject to approval. The contractor shall provide a competent instructor to advise the owner or his representative of the proper operation and servicing of equipment installed. Also provide IOM on DVD or thumbdrive- include in closeout documentation.

1.8 WORK INCLUDED:

All labor and materials to provide a complete mechanical system as shown on the drawings. Coordination drawings to ensure all systems will fit and have proper service clearances/access. Provide all accessory and incidental items, contingencies, light, electrical energy, temporary wiring, scaffolding, fixtures, tools, transportation, etc. necessary for the proper installation of all work described in this section of the specifications.

PART 2 - PRODUCTS

2.1 STANDARDS OF MATERIALS;
All materials used shall be new unless otherwise shown or called for, and shall be furnished in accordance with standard specification of the American Society for Testing Materials, the American Society of Mechanical Engineers, and other guide specifications.

2.2 CONFORMANCE TO SPECIFICATIONS AND SUBMITTAL OF MATERIALS:.

A. Drawings are based on first manufacturer named in specifications. Contractor shall bear any costs altering any other contract or sub-contract resulting from a substitution of equipment for that specified or on which drawings and specifications are based. Where any material or equipment is specified by name of identification of one or more specific manufacturers, and there is no "or equal" wording following the manufacturers listed, then such material or product shall be furnished by the manufacturer (or one of the manufacturers) listed without substitution. Engineers, in these cases, will not consider other manufacturers for approval unless added by addendum. All manufacturers that are not specifically named must be pre-approved at least ten (10) days prior to bid opening. Submission must be made by a bona fide bidder, not a vendor.

B. A triplicate typewritten listing of all materials and equipment (showing specific manufacturer) hereinafter specified or shown on the drawing or required for the complete and proper installation of the mechanical contract involved shall be furnished to the architects and engineers within two weeks after the date of contract signing. The list shall include all specified and proposed substitute items as acceptable under above paragraph.

C. After approval of the list of materials and equipment, one copy shall be returned to the contractor, who shall then proceed with submittal data not submitted with list, including resubmittal of any disapproved items. All submittal data shall be furnished within 30 days after date of contract signing by this contractor.

D. A minimum of four (4) copies of submittal data shall be furnished, plus any additional copies the contractor may wish above one. Electronic submittals will be accepted.

2.3 SHOP DRAWINGS:

A. Shop drawings of all materials or fabricated work shall be submitted for approval. Four sets of such prints must be presented, and no work shall be done until such approval has been obtained.

B. The approval of shop drawings will be general and shall not relieve the contractor from the responsibility for adherence to the contract nor shall it relieve him of the responsibility for any error which may exist.

C. 2.4 EQUIPMENT VARIATIONS:

D. Should contractor submit substitutes which vary in horsepower, electrical characteristics, physical size, number of motors, etc. from those specified, contractor shall bear any and all expenses that may arise in other contractor's work that must be altered to allow use of such substitute equipment. Approval of any such equipment shall be voided should contractor fail to bear any such expenses.

PART 3 - EXECUTION

3.1 DIAGRAMS AND COORDINATION:

A. The drawings are diagrammatic and shall be followed as closely as possible. However, the contractors shall be responsible to coordinate their installation and work out interferences that might occur among themselves. Should interferences occur, the engineers will assist in working them out in the best interests of all contractors concerned and with as little change in the systems as originally planned as possible.

B. The drawings indicate offsets and transitions required, but by no means indicate all such situations. Should contractor elect to prefabricate piping, he shall do so at the risk of having to make field changes to avoid structure, or other trades, at his own expense. Owners, architects, and engineers shall not be liable for extra expenses involved because of the contractor's failure to include adequate allowance in his price for such field problems.

C. Contractor shall consult architectural and structural drawings for all dimensions, ceiling heights, beam depths, locations of partitions, kind and number of fixtures or pieces of equipment, structural member locations, etc. Ductwork shall take precedence over any conflicting pressure piping in same area. Provide scaled drawings indicating all mechanical equipment, piping, ductwork, etc. and all other related trades to ensure no conflicts prior to construction.

D. The MC shall obtain the architectural base plan model from the architect. A meeting of all trades shall be required for each area of the building to identify proposed routings and options. An agreed upon time schedule to complete coordination drawings/phases must be documented and provided to the Design Team.

E. The MC shall then produce mechanical coordination drawings (while having regular conversations and meetings with all other trades) with all piping and equipment. The drawings shall incorporate the drawings provded by the other trades (plumbing, fire protection, structural, and electrical). The drawings shall be to scale, dimensioned and clearly identified. The drawings shall indicate bottom of pipe for all equipment. Upon completion, forward to the Project Team for review. Adjust drawings as necessary during the coordination process. Once all conflicts have been resolved, the MC shall provide the Architect and Engineer with a complete set of coordination drawings and digital files.

F. In addition, the MC shall send the completed overall coordination drawings to a printer so that the Plumbing, Fire Protection, and Electrical Contractors can order copies at their expense. The MC is responsible for providing the Engineer's set, the Architect's set, and the MC's set(s).

G. The final overall coordination drawings/model must be completed prior to any plumbing, fire protection, mechanical and electrical work starting on the job.

3.2 EXCAVATING AND BACKFILLING:

A. The contractor shall be responsible for all excavating in connection with the work in corresponding Heating and Air Conditioning Sections of the contract. All such excavating shall be done in a manner as not to endanger the stability of the structure or any part thereof, or any work in place by other contractors. All material to be excavated shall be unclassified. Refer to section 012000 for unit prices for trench rock removal and unsuitable soils.

B. Ditching variations from that indicated on plans shall be approved by the architects before excavating; no work shall be done until such approval has been obtained. Where outside ditches occur, finish surfaces as original to match existing, including patching of walks and paving. All backfilling material shall be installed and thoroughly compacted in 6 to 8 inch layers using sheep's foot rollers, mechanical tampers, or other suitable approved compaction equipment, of size and type required. All backfill within perimeter l0 feet beyond such areas, shall be compacted to at least l00% of maximum density at optimum moisture content throughout entire depth of backfill material. Maximum density with ASTM-D-698, method C. All other backfill shall be compacted same as previously described, except 95%. Provide necessary OSHA shoring for protection of trenches. No rock, trees, stumps rubbish, etc., shall be used for backfill and all such materials and surplus earth shall be removed by the contractor from the project and disposed of at his own expense where directed by the architects.

3.3 TESTS:

A. Upon completion of the installation, all systems shall be properly adjusted and tested by the contractor and placed in perfect operating condition, subject to the approval of the architects and engineers. Provide all labor and equipment to perform this work.

B. All tests for mechanical work shall be in strict accordance with local codes, and regulations and to the satisfaction of local inspector and architects and engineers. Where pressure testing is applicable, the test pressure shall be for l25 p.s.i.g. or 50% above working pressure, whichever is the higher. Any defects indicated by the tests shall be corrected immediately by the contractor without cost to the owner.

3.4 ALL AIR SYSTEMS, CONTROLS AND HYDRONIC SYSTEMS:

These systems shall be balanced by a certified TABC engineer and a Balance Report shall be furnished to the Engineer with copies in the Operating and Maintenance Instructions. The pumps shall be installed prior to trimming the impellers. Balance system and then remove impellers and have trimmed to match actual system curve at design conditions. The pumps shall be laser aligned by the pump mfg. after installation/grouting.

3.5 CLEANING UP:

The contractor shall keep the property and building free of rubbish and waste material due to the installation of work included in this specification and shown on plans. After completion of the work and all tests have been made, the contractor shall remove all rubbish incidental to contract and shall leave all portions of the work in a clean condition.

3.6 INSPECTIONS:

The contractor must at all times lend any assistance necessary for architects or engineers or their authorized representative to make tests, inspections, etc. Provide all materials, equipment and labor necessary for tests or inspections as required. Coordinate phasing with general contractor. Provide temporary valves, piping, etc. as required to avoid disruption of normal operation.

3.7 PROGRESS:

The work must be installed as fast as the progress of the other trades will permit and when directed by the architects and engineers.

3.8 WORKMANSHIP:

All materials and equipment shall be installed and completed in a first class workmanlike manner. The architects and engineers reserve the right to reject any damaged equipment and to direct the removal and replacement of any item, which in their opinion shall not represent acceptable workmanship. Such removal and replacement shall be done when directed in writing by architects and engineers at the contractor's expense and without additional cost to the owner.

3.9 SPECIFICATIONS AND DRAWINGS:

In the case of discrepancy between drawings and specifications, or the differences in general conditions, supplementary general conditions or terms and conditions for all contractual work, the better quality and greater quantity shall govern.

3.10 FEES AND PERMITS:

The mechanical contractor shall obtain and pay for all permits relating to his contract, arrange for necessary inspections and furnish a certificate of inspection and approval from the public authority and underwriters having jurisdiction where the apparatus is installed. All fees and charges in connection with the above shall be paid for by mechanical contractor.

3.11 COMMISSIONING:

All pumps, drives, chiller, boilers, AHU's, VAV boxes, DDC/BMS system, and all equipment provided shall have a factory start-up and certified Test & Balance.

3.12 TRAINING:

All systems shall be demonstrated to the Owner (and their designated personnel). This shall include all recommended operations and maintenance items/practices as well as basic trouble shooting. ALL sessions shall be recorded such that new personnel can watch the recording and benefit as if they were in attendance. Training sessions shall be provided on DVD, thumb drive, or other electronic storage media as desired by the Owner.

END OF SECTION 23 05 00

SECTION 23 05 10 - BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and the Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 QUALITY ASSURANCE

Qualify welding processes and operators for piping according to provisions of ASME B3I Series "Code for Pressure Piping."

Certify that each welder has passed AWS qualification test for the welding processes involved and that certification is current.

PART 2 - PRODUCTS

2.1 PIPE FITTINGS:

Pipe threads: ASME B1.20.1 for factory-thread pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Pipe Flange Gasket Materials: Suitable for the chemical and thermal conditions of the piping system contents.

B. AWWA C110, rubber, flat face, I/8-inch maximum thickness, except where thickness or specific material is indicated.

C. Flange Bolts and Nuts: ASME BI8.2.1, carbon steel, except where other material is indicated.

D. Welding Filler Metals: Comply with AWS DI0.I2 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

SOLDER FILLER METAL: ASTM B32 Alloy SN95:Tin (95%) and silver (5%) having 0.I0% lead content.

2.3 PIPING SPECIALTIES

A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type where required to conceal protruding fittings and sleeves.

B. Inside Diameter: Closely fit around pipe, tube, and insulation. Outside Diameter: Completely cover opening.

C. Stamped Steel: One-piece, with set-screw and chrome-plated finish.

D. Dielectric Fittings: Assembly or fitting having insulating material isolating joined dissimilar metals to prevent galvanic action and stop corrosion.

E. Dielectric Unions: Factory-fabricated, union assembly for 250-psig minimum working pressure at a 180 deg F temperature.

F. Sleeves: The following materials are for wall, floor, slab and roof penetrations.

Steel, Sheet-Metal: 24 ga. or heavier galvanized sheet metal, round tube closed with welded longitudinal joint.

2.4 IDENTIFYING DEVICES AND LABELS

A. Equipment Nameplates: Metal nameplate with operational data engraved or stamped, permanently fastened to equipment.

B. Snap-On Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid snap-on, color-coded pipe markers, conforming to ASME A13.1. Provide pipe identification as follows:
   a. Chilled water supply
   b. Chilled water return
   c. Hot water supply
   d. Hot water return
   e. Cold water makeup

C. Engraved Plastic-Laminated Signs: ASTM D709, Type I, cellulose, phenolic-resin-laminate engraving stock, Grade ES-2, black surface, black phenolic core, with white melamine subcore.

D. Fabricate in sizes required for message.

E. Engraved with engraver's I/2" high standard letter style, of sizes and with wording to match equipment identification.

F. Punch for mechanical fastening.

G. Thickness: 1/8 inch.

H. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.

2.5 VALVES: Provide brass valve tags for all valves. Provide a chart/drawing under glass in the boiler room identifying the valve locations and areas.

2.6 GROUT

A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.

B. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

C. Design Mix: 5000-psi (34.50MPa), 28-day compressive strength.

D. Packaging: Premixed and factory-packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS--COMMON REQUIREMENTS

A. General: Install piping as described below, except where system Sections specify otherwise.

B. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design

considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.

C. Install components having pressure rating equal to or greater than system operating pressure.

D. Install piping free of sags and bends.

E. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated.

F. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

G. Install piping to allow application of insulation plus 1-inch clearance around insulation.

H. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

I. Install fittings for changes in direction and branch connections.

J. Install couplings according to manufacturer's printed
K. instructions.
L. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings.

M. Sleeves are not required for core drilled holes.

N. Install sleeves for pipes passing through concrete and masonry walls, concrete floor and roof slabs.

O. Install large enough sleeves to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

P. Steel Pipe Sleeves: For pipes smaller than 6 inches.
Q. Steel Sheet-Metal Sleeves: For pipes 6 inches and
R. larger that penetrate gypsum-board partitions.

S. Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.

T. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with U.L. firestopping sealant material, 2-hr. rating as manufactured by 3M, Dow Corning, T&B, or approved equal.

U. Verify final equipment locations for roughing in.

V. Refer to equipment specifications in other Sections for roughing-in requirements.

W. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping system Sections. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

X. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

Y. Soldered Joints: Construct joints according to AWS "Soldering Manual," Chapter 22 "The Soldering of Pipe and Tube."

Z. Brazed Joints: Construct joints according to AWS "Brazing Manual" in the "Pipe and Tube" chapter.

AA. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full inside diameter. Join pipe fittings and valves as follows:

BB. Welded Joints: Construct joints according to AWS Dl0.l2 "Recommended Practices and Procedures for Welding Low Carbon Steel Piper" using qualified processes and welding operators according to the "Quality Assurance" Article.

CC. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

DD. Piping Connections: Make piping connections as specified below.

EE. Install unions in piping 2 inches and smaller adjacent to each valve and at final connection to each piece of equipment having a 2-inch or smaller threaded pipe connection. Install flanges in piping 2-l/2 inches and larger adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.

FF. Wet Piping Systems (Water): Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION--COMMON REQUIREMENTS

A. Install equipment to provide the maximum possible headroom where mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Architect.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.

D. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.

E. Install equipment giving right-of-way to piping systems installed at a required slope.

3.3 LABELING AND IDENTIFYING

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
B. Plastic markers, with application systems. Install on pipe insulation segment where required for hot noninsulated pipes. Locate pipe markers wherever piping is exposed in finished spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums), and exposed exterior locations as follows:
C. Near each valve and control device.

D. Near each branch, excluding short take-offs for terminal units. Mark each pipe at branch, where flow pattern is not obvious.

E. Near locations where pipes pass through walls, floors, ceilings, or enter inaccessible enclosures.

F. At access doors, manholes, and similar access points that permit view of concealed piping.

G. Near major equipment items and other points of origination and termination.

H. Spaced at a maximum of 25-foot intervals along each run. Reduce intervals to 15 feet in congested areas of piping and equipment.

I. On piping above removable acoustical ceilings.

J. Equipment: Install engraved plastic laminate sign or equipment marker on or near each major item of mechanical equipment. Attach directly to the ceiling grid below all units/VAV boxes (pop-rivet).

K. Install identification phenolic tag or sticker (if allowed) on the grid under valves if away from equipment. Coordinate color with owner.
L. All mechanical valves to be tagged and a chart should be posted at each mechanical room.

3.4 PAINTING AND FINISHING

Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 CONCRETE BASES

Construct concrete equipment bases of dimensions indicated, but not less than 4 inches larger than supported unit in both directions. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi, 28-day compressive strength concrete.

3.6 GROUTING

Install nonmetallic nonshrink grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's printed instructions.

END OF SECTION 23 05 10

SECTION 23 05 13 - ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT
PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Related Sections: Separate electrical components and materials required for field installation and electrical connections are specified in Division 26. Refer to Division 26 for acceptable manufacturers.

1.2 SUMMARY:

A. This section specifies the basic requirements for electrical components which are an integral part of packaged mechanical equipment. These components include, but are not limited to factory installed motors, starters, and disconnect switches furnished as an integral part of packaged mechanical equipment.

B. Specific electrical requirements (i.e. horsepower and electrical characteristics) for mechanical equipment are specified within the individual equipment specification sections, and/or scheduled on the drawings.

1.3 REFERENCES: Comply with National Electrical Code (NFPA 70).

1.4 SUBMITTALS:

No separate submittal is required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification sections.

1.5 QUALITY ASSURANCE: Electrical components and materials shall be UL labeled.

PART 2 - PRODUCTS

2.1 MOTORS:

The following are basic requirements for simple or common motors. For special motors, more detailed and specific requirements are specified in the individual equipment specifications.

A. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.

B. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.

C. 2-speed motors shall have 2 separate windings on poly-phase motors.

D. Temperature Rating: Rated for 40 deg. C environmental with maximum 50 deg. C temperature rise for continuous duty at full load (Class A Insulation).

E. Starting capability: Frequency of starts as indicated by automatic control system, and not less than 5 evenly time spaced starts per hour for manually controlled motors.

F. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.

G. Motor construction: NEMA Standard MG 1, general purpose, continuous duty, Design "B", except "C" where required for high starting torque.

H. Frames: NEMA Standard No. 48 or 54; use driven equipment manufacturer's standards to suit specific application.

I. Bearings: Ball or roller bearings with inner and outer shaft seals; Re-greasable, except permanently sealed where motor is normally inaccessible for regular maintenance;

J. Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.

K. For fractional horsepower, light duty motors, sleeve type bearings are permitted.

L. Enclosure Type:

a) Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation;

b) Guarded drip-proof motors where exposed to contact by employees or building occupants;

c) Weather protected Type I for outdoor use, Type II where not housed;

M. Overload protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.

N. Noise rating: "Quiet" rating on motors located in occupied spaces of building.

O. Efficiency: Provide Nema Premium efficiency for single speed, polyphase, 1-500 horsepower, 2, 4 and 6 pole, squirrel cage induction motors, NEMA design A or B, continuous rated.

P. Nameplate: Indicate the full identification of manufacturer, ratings, efficiency rating, characteristics, construction, special features and similar information.

2.2 STARTERS, ELECTRICAL DEVICES, AND WIRING:

A) Motor Starter Characteristics: All pump motor starters (excluding sump and domestic hot water circulating pump) shall contain a Square D or similar approved equal Form H20 solid state overload relay to protect against phase failure.

B) Enclosures: NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 3R with conduit hubs, or units in hazardous locations which shall have NEC proper class and division.

C) Type and size of starter shall be as recommended by motor manufacturer and the driven equipment manufacturer for applicable protection and start-up condition. All starter/disconnects shall be heavy duty type.

D) Manual switches shall have:

i) Pilot lights and extra positions for multi-speed motors.
ii) Overload protection: Melting alloy type thermal overload relays.

E) Magnetic Starters:

F) Hand-off-auto switch with pilot light, properly arranged for single speed or multi-speed operation as indicated.

G) Trip-free thermal overload relays, each phase.

H) Interlocks, pneumatic switches and similar devices as required for coordination with control requirements of Division-23 Controls section.

I) Built-in 120 volts control circuit transformer, fused from line side, where service exceeds 240 volts.
J) Externally operated manual reset.

K) Under-voltage release or protection.
L) Motor connections:

M) Flexible conduit, except where plug-in electrical cords are specifically indicated.

N) Disconnect Switches:

O) Enclosures: NEMA 3R

P) Fusible switches: Fused, each phase; heavy duty; horsepower rated; non-feasible heavy quick-make, quick-break mechanism; dead front line side shield; solderless lugs suitable for copper or aluminum conductors; spring reinforced fuse clips; electro silver plated current carrying parts; hinged doors; operating lever arranged for locking in the "OPEN" position; arc quenchers; capacity and characteristics as indicated.

Q) Non-fusible switches: For equipment 2 horsepower and smaller, shall be horsepower rated; toggle switch type; quantity of poles and voltage rating as indicated. For equipment larger than 2 horsepower, switches shall be the same as fusible type.

PART 3 - EXECUTION

Provide separate disconnect at load where motor (or electrical load) is not within sight of starter, or more than 50 feet from starter. Where starters are not within sight of feeding electrical panel, provide combination starter-disconnect. Where starters for such loads are built-in equipment package, provide separate disconnect. VAV boxes shall have separate stand alone disconnect. Where such disconnects located outside structure, they shall be raintight type.

Electrical contractor will provide one power supply to each electrically operated item of equipment in contract. Should such items of equipment contain more than one electrical load, the mechanical contractor shall be responsible to provide circuit breakers or fuse blocks to protect such load, plus gutters and troughs to distribute such loads. All equipment having more than one point of power shall have any and all protective fuses, breakers, etc. as necessary provided by the factory.

Note: **Heating & Air Conditioning contractor shall furnish and install starters and disconnects. Electrical contractor will then wire to line side of each starter and disconnect. Electrical contractor shall also wire from load side of each starter and disconnect to the respective motor terminals. All wire, conduit and junction boxes shall conform to electrical specifications. All work shall be performed by a licensed electrician.**

All AHU's having multiple fans shall all items individually protected by the mfg such that the contractors have single point power and a standard fuse/breaker size needed.

Consult the electrical drawings in detail prior to bidding to ensure all items are completely addressed!
END OF SECTION 23 05 13

SECTION 23 05 15 - MECHANICAL - ADJUSTABLE FREQUENCY DRIVES

PART 1 GENERAL

SCOPE OF WORK

This section provides specification requirements for adjustable frequency drives, variable speed drives or herein identified as AC Drives. Drives will be used in all air handling units and return fans.

The AC Drive manufacturer shall furnish, field test, adjust and certify all installed AC Drives for satisfactory operation.

Any exceptions/deviations to this specification shall be indicated in writing and submitted with the quotation.

Drives shall not contain bypass operation capability.

REFERENCES

ANSI/NFPA 70 - National Electrical Code.

ANSI C84.1 - Voltages Tolerances for North America.

CSA C22.2 No. 14-M91 - Industrial Control Equipment.

IEC 68 Part 2-3 - Basic Environmental Testing Procedures Part 2: Tests - Test Ca: Damp Heat.

IEC 146.1 - Semiconductor Converters - General Requirements and Line Commutated Converters Part 1-1: Specifications of Basic Requirements.

IEC 664 - Insulation Coordination for Equipment Within Low-Voltage Systems.

IEC 447 - Man-Machine Interface Actuating Principles.

IEC 439 Part 1 - Low Voltage Switchgear and Control gear Assemblies.

IEC 947 - Low Voltage Switchgear and Control gear Components.

IEC 364 - Electrical Installation of Buildings.

IEC 204/NFPA 79 - Electrical Equipment of Industrial Machines/Industrial Machinery.

IEC 106 - Guide for Specifying Environmental Conditions for Equipment Performance Rating.

IEC 529 - Degrees of Protection Provided by Enclosure.

IEC 1000 - Electromagnetic Compatibility.

IEC 721 - Classification of Environmental Conditions.

IEC 255-8 Overload Relays.

IEC 801-2,-3,-4,-5 - Immunity Tests.

NEMA ICS 6 - Industrial Control and Systems Enclosures.

NEMA ICS, Part 4 - Overload Relays.

NEMA 250 - Enclosures for Electrical Equipment.

NEMA ICS 2-321 - Electrical Interlocks.

NEMA ICS7 - Industrial Control and Systems Adjustable Speed Drives.

NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection Installation and Operation of Adjustable Speed Drives.

UL 50 - UL Standard for Safety Enclosures for Electrical Equipment.

UL 98 - UL Standard for Disconnect Switches.

UL 507 - UL Standard for Safety Electric Fans.

UL 508 - UL Standard for Safety Industrial Control Equipment.

UL 508C - UL Standard for Safety Power Conversion Equipment.

UL 991 - UL Standard for Safety Tests for Safety Related Controls employing Solid-State Devices.

OSHA 1910.95 - AC Drive Controller Acoustical Noise.

Conforming to National Safe Transmit Association and International Safe Transmit Association Test for Packages Weighing 100 lbs or Over.

SUBMITTALS

Six copies of approval drawings shall be furnished for Engineers approval. These drawings shall consist of elementary power and control wiring diagrams and enclosure outline drawings. The enclosure drawings shall include front and side views of the enclosures with overall dimensions and weights shown, conduit entrance locations and nameplate legends.

Standard catalog sheets showing voltage, horsepower, maximum current ratings and recommended replacement parts with part numbers shall be furnished for each different Horsepower rated AC Drive provided.

WARRANTY

Two year parts warranty shall be provided on materials and workmanship from the date of final acceptance.

QUALITY ASSURANCE

The manufacturer of the AC Drive shall be a certified ISO 9001 facility.

The AC Drive and all associated optional equipment shall be UL Listed according to UL 508 C - Power Conversion Equipment. A UL label shall be attached inside each enclosure as verification.

The AC Drive shall be designed, constructed and tested in accordance with NEMA, NEC, VDE, IEC standards and CSA certified.

Every power converter shall be tested with an actual ac induction motor, 100% loaded and temperature cycled within an environment chamber at 40° C (104° F). Documentation shall be furnished to verify successful completion at the request of the engineer.

All Drive door mounted pilot devices shall be tested to verify successful operation. Documentation shall be furnished upon the request of the engineer.

The AC Drive shall be submitted to a Hi-Pot test with all enclosed devices mounted and wired, prior to shipment.

PART 2 PRODUCT

MANUFACTURERS

The AC Drive shall be provided by Square D Company, Class 8839, Type ATV-66, Reliance, Graham, ABB or prior approved equal.

Alternate control techniques other than pulse width modulated (PWM) are not acceptable.

GENERAL DESCRIPTION

The AC Drive shall convert the input ac mains power to an adjustable frequency and voltage as defined in the following sections.

The input power section shall utilize a full wave bridge design incorporating diode rectifiers. The diode rectifiers shall convert fixed voltage and frequency, ac line power to fixed dc voltage. This power section shall be insensitive to phase rotation of the ac line.

The dc bus shall have external connections for standby battery back-up or for linking multiple AC Drives, with dc buses, for management of regeneration power.

The output power section shall change fixed dc voltage to adjustable frequency ac voltage. This section shall utilize insulated gate bipolar transistors (IGBTs) or intelligent power modules (IPMs) as required by the current rating of the motor.

The VFD shall have a dual 5% DC link reactor on the positive and negative rails of the DC bus to minimize power line harmonics and protect the drive from power line transients. The reactor shall be non-saturating (linear) to provide full harmonic filtering throughout the entire load range. VFD's with saturating (non-linear) DC link reactors shall require an additional 5% AC line reactor to provide acceptable harmonic performance at full load, where harmonic performance is most critical.

CONSTRUCTION

The AC Drive shall be mounted in a Type 1 enclosure with an external operated disconnect device..

A mechanical interlock shall prevent an operator from opening the AC Drive door when the disconnect is in the ON position. Another mechanical interlock shall prevent an operator from placing the disconnect in the ON position while the AC Drive door is open. It shall be possible for authorized personnel to defeat these interlocks.

Provisions shall be provided for locking all disconnects in the OFF position with up to three padlocks.

Current limiting fuses shall be installed and wired to the AC Drive input.

Provisions shall be made for accepting a padlock to lock the enclosure door

MOTOR DATA

The AC Drive shall be sized to operate the air handling unit fans as listed on the drawings.

APPLICATION DATA

The AC Drive shall be sized to operate F.C. fans in air handling units.

The speed range shall be from a minimum speed of 0.5 Hz to a maximum speed of 400 Hz.

ENVIRONMENTAL RATINGS

The AC Drive shall be of construction that allows operation in a pollution Degree 3 environment. The AC Drive shall meet IEC 664-1 and NEMA ICS 1 Standards. AC Drives that are only rated for Pollution Degree 2 environment shall not be allowed.

The AC Drive shall be designed to operate in an ambient temperature from 32° F to 104° F.

The storage temperature range shall be -25° C to 70° C (-13° F to 158° F).

The maximum relative humidity shall be 95% at 40° C (104° F), non-condensing.

The AC Drive shall be rated to operate at altitudes less than or equal to 3,300 ft (1000m). For altitudes above 3,300 ft (1,005 m), de-rate the AC Drive by 1.2% for every 300 ft (100m).

The AC Drive shall meet the IEC 68-2 operational vibration specification.

RATINGS

The AC Drive shall be designed to operate from an input voltage of 400 15% VAC and 460 15% VAC.

The AC Drive shall operate from an input voltage frequency range from 47.5 to 63 Hz.

The displacement power factor shall not be less than .95 lagging under any speed or load condition.

The efficiency of the AC Drive at 100% speed and load shall not be less than 96%.

The variable torque rated AC Drive overcurrent capacity shall be 150% for 1 minute.

The output carrier frequency of the AC Drive shall be randomly modulated and selectable at 2, 4, or 10 kHz depending on Drive rating for low noise operation. No AC Drive with an operable carrier frequency above 10 kHz shall be allowed.

The output frequency shall be from 0.1 to 400 Hz for Drives up to 75 hp. At horsepowers above 75 hp, the maximum output frequency will be 200 Hz.

The AC Drive will be able to develop rated motor torque at .5 Hz (60 Hz base) in a Sensorless Flux Vector mode using a standard induction motor without an encoder feedback signal.

PROTECTION

Provide protection for single phase and phase reversal conditions for all drives on the project.

Upon power-up the AC Drive shall automatically test for valid operation of memory, option module, loss of analog reference input, loss of communication, dynamic brake failure, dc to dc power supply, control power and the pre-charge circuit.

The AC Drive shall be UL 508C listed for use on distribution systems with up to 65,000A RMS available fault current. The Power Converter shall meet short circuit withstandability of 65,000 rms

symmetrical amperes as defined by NEMA ICS 7.1.09 and have the value listed on the AC Drive nameplate.

The Power Converter shall be protected against short circuits, between output phases and ground; and the logic and analog outputs.

The AC drive shall have a minimum ac undervoltage power loss ride-through of 200 milliseconds. The AC Drive shall have the user defined option of frequency fold-back to allow motor torque production to continue to increase the duration of the powerloss ride-through.

The AC drive shall have a selectable ride through function which will allow the logic to maintain control for a minimum of one second without faulting.

For a fault condition other than a ground fault, short circuit or internal fault, an auto restart function will provide up to 5 programmable restart attempts. The programmable time delay before restart attempts will range from 1 second to 600 seconds.

The deceleration mode of the AC Drive shall be programmable for normal and fault conditions. The stop modes shall include free-wheel stop, fast stop and dc injection braking.

Upon loss of the analog process follower reference signal, the AC Drive shall fault and/or operate at a user defined speed set between software programmed low speed and high speed settings.

The AC Drive shall have solid-state I^2t protection that is UL Listed and meets UL 508 C as a Class 10 overload protection and meets IEC 947. The minimum adjustment range shall be from .45 to 1.05 percent of the current output of the AC Drive.

The AC Drive shall have a thermal switch with a user selectable prealarm that will provide a minimum of 60 seconds delay before overtemperature fault.

The AC Drive shall utilize bonded fin heatsink construction for maximum heat transfer.

The AC Drive shall have a programmable fold-back function that will anticipate a controller overload condition and fold back the frequency to avoid a fault condition.

The output frequency shall be software enabled to fold back when the motor is overloaded.

There shall be 3 skip frequency ranges that can each be programmed with a selectable bandwidth of 2 or 5 Hz. The skip frequencies shall be programmed independently, back to back or overlapping.

The AC Drive shall include Metal Oxide Varistors (MOVs) wired to the incoming AC Mains.

ADJUSTMENTS AND CONFIGURATIONS

The AC Drive shall self-configure to the main operating supply voltage and frequency. No operator adjustments will be required.

Upon power-up, the AC Drive will automatically send a signal to the connected motor and store the resulting resistance data into memory. The inductance data will be measured during no-load operation when operating at a frequency between 20-60 Hz. The AC Drive will automatically optimize the operating characteristics according to the stored data.

The AC Drive will be factory pre-set to operate most common applications.

A choice of three types of acceleration and deceleration ramps will be available in the AC Drive software; linear, S curve and U curve.

The acceleration and deceleration ramp times shall be adjustable from .1 to 999.9 seconds.

The volts per frequency ratios shall be user selectable to meet variable torque loads, normal and high torque machine applications.

The memory shall retain and record run status and fault type of the past 8 faults.

Slip compensation shall be a software enabled function.

The software shall have a NOLD (no load) function that will reduce the voltage to the motor when selected for variable torque loads. A constant volts/Hz ratio will be maintained during acceleration. The output voltage will then automatically adjust to meet the torque requirement of the load.

The AC Drive shall offer programmable dc injection braking that will brake the ac motor by injecting dc current and creating a stationary magnetic pole in the stator. The level of current will be adjustable between 50-150% of rated current and available from 0.0-30 seconds continuously. For continuous

operation after 30 seconds, the current shall be automatically reduced to 50% of the nameplate current of the motor.

Sequencing logic will coordinate the engage and release thresholds and time delays for the sequencing of the AC Drive output, mechanical actuation and dc injection braking in order to accomplish smooth starting and stopping of a mechanical process.

OPERATOR INTERFACE

The operator interface terminal will offer the modification of AC Drive adjustments via a touch keypad. All electrical values, configuration parameters, I/O assignments, application and activity function access, faults, local control, adjustment storage, self-test and diagnostics will be in plain English. There will be a standard selection of 4 additional languages built-in to the operating software as standard.

The display will be a high resolution, LCD backlighted screen capable of displaying graphics such as bar graphs as well as six lines of twenty-one alphanumeric characters.

The AC Drive model number, torque type, software revision number, horsepower, output current, motor frequency and motor voltage shall all be listed on the drive identification display as viewed on the LCD display.

The display shall be configured to display one or two bar graphs with numeric data that are selectable and scaleable by the operator. A user defined label function shall be available. As a minimum the selectable outputs shall consist of speed reference, output frequency, output current, motor torque, output power, output voltage, line voltage, dc voltage, motor thermal state, drive thermal state, elapsed time, motor speed, machine speed reference and machine speed.

A single keystroke scrolling function shall allow dynamic switching between display variables.

The terminal keypad will consist of programmable function keys. The functions will allow both operating commands and programming options to be preset by the operator. A hardware selector switch will allow the terminal keypad to be locked out from unauthorized personnel.

The operator terminal will offer a general menu consisting of parameter setting, I/O map, fault history, and drive configuration. A software lock will limit access to the main menu. The main menu will consist of keypad configuration, drive configuration, general configuration, diagnostic mode and drive initialization screens.

There will be arrow keys that will provide the ability to scroll through menus and screens, select or activate functions or increase the value of a selected parameter.

A data entry key will allow the user to confirm a selected menu, numeric value or allow selection between multiple choices.

An escape key will allow a parameter to return the existing value if adjustment is not required and the value is displayed. The escape function will also return to a previous menu display.

A RUN key and a STOP key will command a normal starting and stopping as programmed when the AC Drive is in keypad control mode. The STOP key must be active in all control modes.

The AC Drive shall have three LEDs mounted on the front panel to indicate functional status. A green LED will verify that the AC Drive power supply is on. A red LED indicator will indicated an AC Drive fault. A yellow LED indicator will designate a pending fault condition.

The status LEDs shall be able to be remotely mounted up to 3 meters from the AC Drive.

A user interface shall be available that is a Windows 3.1 based personal computer, serial communication link or detachable operator interface.

The Keypad and all door-mounted controls must be Type 1 rated.

CONTROL

External pilot devices shall be able to be connected to a terminal strip for starting/stopping the AC Drive, speed control and displaying operating status. All control inputs and outputs will be software assignable.

2-wire or 3-wire control strategy shall be defined within the software. External relays or logic devices will not be allowed.

The control power for the digital inputs and outputs shall be 24 VDC.

The internal power supply incorporates an automatic current fold-back that protects the internal power supply if incorrectly connected or shorted. The transistor logic outputs will be current limited and not be damaged if shorted or excess current is pulled.

All logic connections shall be furnished on pull-apart terminal strips.

There will be two software assignable, optically isolated analog inputs. The analog inputs will be software selectable and consist of the following configurations: 0-20 mA, 4-20 mA, 20-4 mA, x-20 mA (where x is user defined) 0-5 V, 1-5 V or 0-10 V.

There will be four software assignable, optically isolated logic inputs that will be selected and assigned in the software. The selection of assignments shall consist of run/reverse, jog, plus/minus speed (two inputs required), setpoint memory, preset speeds (up to two inputs), auto/manual control, controlled stop, terminal or keypad control, by-pass (two inputs required), motor switching, and fault reset.

There will be two software assignable, optically assignable analog outputs that can be selected and assigned in the software. The analog output assignments shall be proportional to the following motor characteristics: frequency, current, power torque, voltage and thermal state. The output signal will be selectable from 0-20 mA or 4-20 mA.

Two voltage-free Form C relay output contacts will be provided. One of the contacts will indicate AC Drive fault status. The other contact will be user assignable.

There shall be a hardware input/output extension module which also provides interlocking and sequencing capabilities. The module shall be fully isolated and housed in a finger safe enclosure with pull apart terminal strips. The module will add four logic inputs, two analog inputs, two relay outputs and one analog output. All of the I/O will be user assignable in the software as previously defined.

The AC Drive door mounted control island shall include a power ON, Drive RUN, Drive Fault Light and Hand-Off-Auto selector switch with Manual Speed Potentiometer.

The AC Drive control island shall accept meters to display Power, Amperes, Voltage, and Hertz.

The owner will utilize a D.D.C. System to operate all mechanical equipment (including drives). System must be fully compatible with all vendors listed in the base and alternate bids.

BRAKING (APPLICATION DEPENDENT OPTION)
Note: When braking certain types of loads, there is the conversion of kinematic energy into electrical energy by the motor which is returned to the AC Drive. Dynamic braking can be chosen to absorb this energy and avoid causing the AC Drive to inadvertently shut down. The energy is dissipated across a resistor that is connected to the drive. For constant torque drive controllers, the dynamic braking unit must be capable of stopping 1.5 per unit motor torque from base frequency to 0.5 Hz with sensorless flux vector control mode.

Provisions shall be made to protect the Dynamic Braking Resistor against overload and overcurent due to DB switch failure. This protection must be resettable without replacement of fuses or other devices.

The dynamic brake resistor shall be provided and connect to existing terminals on the AC Drive. The resistor shall mount externally to the AC Drive enclosure. An insulated gate bi-polar transistor (IGBT) will be provided in the AC Drive to switch excess regenerative energy to the braking resistor. The braking resistor will be of a size calculated to stop six times motor inertia at 1.5 per unit motor torque.

ISOLATION-CONTACTORS

The AC Drive shall include IEC rated isolation contactors complete with thermal overload relay, circuit breaker disconnect interlocked with the door, control circuit transformer, motor flux decay timer and AFC/OFF switch.

PART 3 EXECUTION

INSPECTION

Verify that the location is ready to receive work and the dimensions are as indicated.

Do not install AC Drive until the building environment can be maintained within the service conditions required by the manufacturer.

PROTECTION

Before and during the installation, the AC Drive equipment shall be protected from site contaminants.

INSTALLATION

Installation shall be in compliance with manufacturer's instructions, drawings and recommendations.

The AC Drive manufacturer shall provide a factory certified technical representative to supervise the contractor's installation, testing and start-up of the AC Drives furnished under this specification.

TRAINING

An on-site training course shall be provided by a representative for the AC Drive manufacturer to maintenance personnel.

END OF SECTION 23 05 15

SECTION 23 05 19 - MECHANICAL METERS AND GAUGES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUBMITTALS

Product data for each type of meter, gauge, and fitting specified. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit a meter and gauge schedule showing manufacturer's figure number, scale range, location, and accessories for each meter and gauge.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Liquid-in-Glass Thermometers:

- Marsh Instrument Co.
- Marshalltown Instruments, Inc.
- H.O. Trerice Co.
- Weiss Instruments, Inc.
- Weksler Instruments Corp.

Pressure gauges:

- Ashcroft by Dresser Industries, Instrument Div.
- Marsh Instrument Co.
- Marshalltown Instruments, Inc.
- H.O. Trerice Co.
- Weiss Instruments, Inc.
- Weksler Instruments Corp.

Test Plugs:

- Peterson Equipment co., Inc.
- Sisco Co., Spedco, Inc.
- H. O. Trerice co.
- Watts Regulator Co.
- Flow Design, Inc.

Flow Control fittings:

- Armstrong Pumps, Inc.
- Bell & Gossett by ITT Corp., Fluid Handling Div.
- Taco, Inc.
- Flow Design, Inc.

2.2 THERMOMETERS, GENERAL

A. Scale Range: Temperature ranges for services listed as follows:

B. Hot Water: 30 to 300 deg F, with 2-degree scale divisions.
C. Chilled Water: 0 to 100 deg F, with 2-degree scale divisions.

D. Boiler Stack: 0 to 1000 degree F

E. Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.

2.3 LIQUID-IN-GLASS THERMOMETERS

A. Description: ASTM E 1, liquid-in-glass thermometer.

B. Case: Die-cast and aluminum-finished in baked-epoxy enamel, glass front, spring secured, 9 inches long.

C. Adjustable Joint: Finished to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.

D. Tube: Red-reading fluid filled with magnifying lens.

E. Scale: Satin-faced nonreflective aluminum with permanently etched markings.

F. Stem: Copper-plated, steel, aluminum, or brass for a separable socket of length to suit installation.

2.4 WELLS

A. Description: Brass or stainless-steel thermometer well.

B. Pressure Rating: Not less than piping system design pressure.

C. Stem Length: To extend 2 inches into fluid.

D. Extension for Insulated Piping: 2 inches nominal, but not less than thickness of insulation.

E. Threaded Cap Nut: With chain permanently fastened to well and cap.

2.5 PRESSURE GAUGES

A. Description: ASME B40.1, Grade A phosphor-bronze Bourdon-tube pressure gauge, with bottom connection.

B. Case: Drawn steel, brass, or aluminum with 4-1/2-inch diameter glass lens.

C. Connector: Brass, 1/4-inch NPS.

D. Scale: White-coated aluminum, with permanently etched markings.

E. Accuracy: Plus or minus 1 percent of range span.

F. Range: Conform to the following:

G. Fluids Under Pressure: 2 times operating pressure.

2.6 PRESSURE-GAUGE ACCESSORIES

Snubbers: 1/4-inch brass bushing with corrosion-resistant porous-metal disc of material suitable for system fluid and working pressure.

PART 3 - EXECUTION

3.1 METER AND GAUGE INSTALLATION, GENERAL

Install meters, gauges, and accessories according to manufacturers' written instructions for applications where used.

3.2 THERMOMETER INSTALLATION

A. Install thermometers and adjust vertical and tilted positions.

B. Install in the following locations and elsewhere as indicated:

C. At inlet and outlet of each hydronic coil in central air-handling units.

D. Thermometer Wells: Install in vertical position in piping tees where thermometers are indicated.

E. Install wells with stem extending minimum of 2 inches into fluid.

F. Fill wells with oil or graphite and secure caps.

3.3 PRESSURE GAUGE INSTALLATION

A. Install pressure gauges in piping tee with pressure gauge valve located on pipe at most readable position.

B. Install in the following locations and elsewhere as indicated:

C. At suction and discharge of each pump.

D. At each central air handling unit chilled water and hot water coil (inlet and outlet).

E. At chilled water inlets and outlets.

F. At the discharge of each pressure reducing valve.

3.4 TEST PLUG INSTALLATION

Install test plugs in piping tees where indicated, located on pipe at most readable position. Secure cap.

3.5 FLOW-CONTROL FITTINGS INSTALLATION

A. General: Install flow fittings for piping systems located in accessible locations at most readable position in return lines.

B. Flow control valves by Flow Design, Griswold, or Nexus shall automatically limit rate of flow to within 5% of specified amount. Flow cartridge shall be removable with free replacement for and during I year warranty period. Valves shall be factory assembled with shutoff valve and 2 P.T. ports and installed on the leaving side of the coil. (Install on supply side of coil, Y-strainer with blowdown valve, shutoff valve and P-T Port. See detail on drawings.

C. Provide Owner one test kit per building. Kit shall include 4-1/2" diaphragm gauge equipped with 10 feet hoses, temperature and pressure sensors, P-T adapters, and labeled carrying case.

D. Locations: Install flow fittings as per details on drawings- as a minimum, provide for each coil on the project- hot and chilled water.

END OF SECTION 23 05 19

SECTION 23 05 23 - MECHANICAL VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to this section.

1.2 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data, including body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Manufacturer: Subject to compliance with requirements, provide products from one of the manufacturers listed in valve schedule.

2.2 VALVE FEATURES, GENERAL

A. Valve Design: Rising stem or rising outside screw and yoke stems.

B. Nonrising stem valves may be used where headroom prevents full extension of rising stems.

C. Pressure and Temperature Ratings: As scheduled and required to suit system pressures and temperatures.

D. Sizes: Same size as upstream pipe, unless otherwise indicated.

E. Operators: Provide the following special operator features:

F. Handwheels, fastened to valve stem, for valves other than quarter turn.

G. Lever handles, on quarter-turn valves 6-inch and smaller.

H. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation. All chilled water and dual temperature valves shall have extended, insulated handles.

I. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.

J. End Connections: As indicated in the valve specifications.

K. Threads: Comply with ANSI B1.20.1.

L. Flanges: Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.

M. Solder-Joint: Comply with ANSI B16.18.

N. Caution: Where soldered end connections are used, use solder having a melting point below 840 deg F for gate, globe, and check valves; below 421 deg F for ball valves.

2.3 BALL VALVES

Ball Valves, 3 Inch and Smaller: Rated for 150 psi saturated steam pressure, 400 psi WOG pressure; two-piece construction; with bronze body conforming to ASTM B 62, full port, chrome-plated brass or stainless steel ball, replaceable "Teflon" or "TFE" seats and seals, blowout-proof stem, and vinyl-covered steel handle.

2.4 GLOBE VALVES

Globe Valves, 2-Inch and Smaller: MSS SP-80; Class 125; body and screwed bonnet of ASTM B 62 cast bronze; with threaded or solder ends, brass or replaceable composition disc, copper-silicon alloy stem, brass packing gland, "Teflon" impregnated packing, and malleable iron handwheel. Provide Class 150 valves meeting the above where system pressure requires.

2.5 BUTTERFLY VALVES

Butterfly Valves, 3-Inch and Larger: MSS SP-67; rated at 200 psi; cast-iron body conforming to ASTM A 126, Class B. Provide valves with field replaceable EPDM sleeve, nickel-plated ductile iron disc (except aluminum bronze disc for valves installed in condenser water piping), stainless steel stem, and EPDM O-ring stem seals. Provide lever operators with locks for sizes 2 through 6 inches and gear operators with position indicator for sizes 8 through 24 inches. Provide lug type.

PART 3 - EXECUTION

3.1 VALVE ENDS SELECTION

A. Select valves with the following ends or types of pipe/tube connections:

B. Copper Tube Size, 2-Inch and Smaller: Solder ends.
C. Steel Pipe Sizes, 2-Inch and Smaller: threaded or grooved end.

D. Steel Pipe Sizes 2-1/2 Inch and Larger: grooved end or flanged.

3.2 VALVE INSTALLATIONS

A. General Application: Use ball and butterfly valves for shut-off duty; globe, ball, and butterfly for throttling duty.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves and unions for each fixture and item of equipment arranged to allow equipment removal without system shutdown. Unions are not required on flanged devices.

D. Install valves in horizontal piping with stem at or above the center of the pipe.

E. Install valves in a position to allow full stem movement.

3.3 FIELD QUALITY CONTROL

A. Tests: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect valves for leaks. Adjust or replace packing to stop leaks; replace valves if leak persists.

B. Install identification phenolic tag or sticker (if allowed) on the grid under valves.
C. All mechanical valves to be tagged and a chart should be posted at each mechanical room.

VALVE PRESSURE/TEMPERATURE CLASSIFICATION SCHEDULES
Note: Provide extended, insulated handles for chilled and dual temperature valves.

VALVES, 2-INCH AND SMALLER

SERVICE	GLOBE	BALL	CHECK
Chilled water	125	150	125
Heating Hot Water	150	150	150

VALVES, 2-1/2-INCH AND LARGER

SERVICE	GLOBE	BALL	CHECK
Chilled water	125	200	125
Heating Hot Water	125	200	125

VALVE SCHEDULE

Ball Valves - 1 Inch to 2 Inch:

MANUFACTURER	THREADED ENDS	SOLDER ENDS
Conbraco (Apollo)	82-100	82-200
Grinnell	3810	3810SJ
Nibco	T-590-Y	S-590-Y
Watts	B-6800	B-6801

Globe Valves - 2 Inch and Smaller:

MANUFACTURER	CLASS 125 THREADED	CLASS 125 SOLDER	CLASS 150 THREADED
Crane	1	1310	17TF
Grinnell	3210	3210SJ	3240
Hammond	IB440	IB423	IB413T
Jenkins	746	1200	106-A-2
Milwaukee	502	1502	590
Nibco	T-211-B T-211-Y	S-211-B S-211-Y	T-235-Y

Butterfly Valves - 3 Inch and Larger:
The following are model numbers for lug-type, with nickel-plated ductile-iron disc:

MANUFACTURER	LEVER	GEAR
Center Line	Series LT	Series LT
Crane	14	14
Conbraco (Apollo)	6L13X-01	6L-13X-02
Grinnell	LC-8209-7	LC-8202-7
Keystone	129	129
Nibco	LD-20103	LD-20105

Provide brass valve tag for each valve. Provide index/drawing under glass in the main mechanical room identifying all valves.
END OF SECTION 23 05 23

SECTION 23 05 29 - MECHANICAL HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawing and general provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

This Section includes hangers and supports for piping and equipment. Consult schedule at end of this section for hanger model numbers.

1.3 SUBMITTALS

Product data for each type of hanger and support.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58.

B. Components include galvanized coatings where installed for piping and equipment that will not have a field-applied finish.

C. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.

D. Mechanical-Anchor Fasteners: Insert-type attachments with pullout and shear capacities appropriate for supported loads and building materials where used.

E. Available Manufacturers: Subject to compliance with requirements, provide products from one of manufacturers listed below.

F. Hangers: B-Line
- Grinnell
- Michigan
- PHD

2.2MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.
C. Washers: ASTM F 844, steel, plain, flat washers.

D. Coat all ferrous items with asphaltum paint immediately after installation to prevent rust and corrosion.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.

C. Install supports with maximum spacings complying with MSS SP-69.

D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

E. Install building attachments within concrete or to structural steel. Space hangers as follows: Pipes up to and including I", 8'-0" on centers. Pipes I-I/4" and larger I0'-0" on centers.

F. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.

G. Do not support anything from the roof deck.

H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

I. Joists: Attach only to panel points- refer to detail on structural drawings for stiff leg requirements if not attached to the panel point.

J. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

K. Individual hangers shall be adjustable wrought clevis hangers.

L. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

M. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.

O. Insulated Piping: Comply with the following installation requirements.

P. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.

Q. Saddles: Install protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.

R. Shields: Install MSS Type 40, protective shields on cold piping with vapor barrier. Shields span an arc of 180 degrees and have dimensions in inches not less than the following:

NPS (Inches)	LENGTH (Inches)	THICKNESS (Inches)
1/4 to 3-1/2	12	0.048
4	12	0.060
5 and 6	18	0.060

HANGER SCHEDULE

SERVICE	MODEL NO.
Chilled water - steel	B-line Fig. B3108 with shield.
Hot water - steel	B-line Fig. B3108 with shield.
Chilled water - copper	B-line Fig. B3170NF with shield.
Hot water - copper	B-line Fig. B3170NF with shield.

Paint **all** hangers prior to installation (or provide factory painted) – NO EXCEPTIONS.

END OF SECTION 23 05 29

SECTION 23 05 48 - MECHANICAL VIBRATION AND SEISMIC CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1. Refer to structural design data for seismic design category. Refer to drawings and this specification for vibration isolation requirements. Seismic Restraint: During design documents phase, the building was classified as Seismic Design Category "C". Consult Structural Drawings to verify if this changed. If it remains a "C" or "D", all natural gas piping and gas fired equipment (boilers, OAU's, etc.) shall be seismically restrained. A letter from a registered NC professional engineer that the system is installed (and was inspected) in compliance with the code.

1.2 SUMMARY

A. This Section includes the following:

1. Elastomeric isolation pads and mounts.
2. Restrained elastomeric isolation mounts.
3. Freestanding and restrained spring isolators.
4. Housed spring mounts.
5. Elastomeric hangers.
6. Spring hangers.
7. Spring hangers with vertical-limit stops.
8. Thrust limits.
9. Pipe riser resilient supports.
10. Resilient pipe guides.
11. Freestanding and restrained air spring isolators.
12. Restrained vibration isolation roof-curb rails.
13. Seismic snubbers.
14. Restraining cables.
15. Steel and inertia, vibration isolation equipment bases.

1.3 DEFINITIONS

A. A_v: Effective peak velocity related acceleration coefficient.

B. OSHPD: Office of Statewide Health Planning & Development for the State of North Carolina. OSHPD assigns a unique anchorage pre approval "R" number to each seismic restraint it tests. The number describes a specific device applied as tested.

1.4 PERFORMANCE REQUIREMENTS

A. Component Seismic Coefficient: Refer to equipment schedule for value for each piece of equipment.

B. Performance Criteria Factor: Refer to equipment schedule for value for each piece of equipment.

C. Attachment Amplification Factor: Refer to equipment schedule for value for each piece of equipment.

1.5 SUBMITTALS

A. Product Data: Include load deflection curves for each vibration isolation device.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Include the following:

1. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
4. Seismic-Restraint Details: Detail fabrication and attachment of seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.
5. Submittals for Interlocking Snubbers: Include load deflection curves up to 1/2-inch (13-mm) deflection in x, y, and z planes.

C. Welding certificates.

D. Air-Mounting System Performance Certification: Include natural frequency, load, and damping tests performed by an independent laboratory or acoustician.

E. Manufacturer Seismic Qualification Certification: Submit certification that all specified equipment will withstand seismic forces identified in "Performance Requirements" Article above. Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculations.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 QUALITY ASSURANCE

A. Seismic-restraint devices shall have horizontal and vertical load testing and analysis performed according to OSHPD and shall bear anchorage pre-approval "R" number, from OSHPD or another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If pre-approved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer. Testing and calculations must include both shear and tensile loads and 1 test or analysis at 45 degrees to the weakest mode.

B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into base. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Flashing, Sheet Metal and Roofing Accessories."

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Seismic Snubber Units: Furnish replacement neoprene inserts for all snubbers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 VIBRATION ISOLATORS

A. Available Manufacturers:

B. Manufacturers:

1. Ace Mounting Co., Inc.

2. B-Line Systems, Inc.
3. Isolation Technology, Inc.
4. Kinetics Noise Control, Inc.
5. Mason Industries, Inc.
6. Vibration Eliminator Co., Inc.
7. Vibration Isolation Co., Inc.

C. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

1. Material: Standard neoprene.
2. Durometer Rating: 70.
3. Number of Layers: 3.

D. Elastomeric Mounts: Double-deflection type, with molded, oil-resistant rubber or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Durometer Rating: 70.

E. Restrained Elastomeric Mounts: All-directional elastomeric mountings with seismic restraint.

1. Materials: Cast-ductile-iron housing containing two separate and opposing, molded, bridge-bearing neoprene elements that prevent central threaded sleeve and attachment bolt from contacting the casting during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

F. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- (6-mm-) thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 100 psig (690 kPa).
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

G. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.

5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

H. Housed Spring Mounts: Housed spring isolator with integral seismic snubbers.

1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.
2. Base: Factory drilled for bolting to structure.
3. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch (6-mm) travel before contacting a resilient collar.

I. Elastomeric Hangers: Double-deflection type, with molded, oil-resistant rubber or neoprene isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

J. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.

K. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.

L. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression and with a load stop. Include rod and angle-iron brackets for attaching to equipment.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.

5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch (6-mm) movement at start and stop.

M. Pipe Riser Resilient Support: All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch- (13-mm-) thick, 60-durometer neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig (3.45 MPa) and for equal resistance in all directions.

N. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes separated by a minimum of 1/2-inch- (13-mm-) thick, 60-durometer neoprene. Factory set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.3 AIR-MOUNTING SYSTEMS

A. Available Manufacturers:

B. Manufacturers:

1. California Dynamics Corp.
2. Firestone Industrial Products Company.
3. Kinetics Noise Control, Inc.
4. Mason Industries, Inc.
5. Vibration Eliminator Co., Inc.

C. Air Mounts: Freestanding, single or multiple, compressed-air bellows.

1. Assembly: Upper and lower steel sections connected by a replaceable, flexible, nylon-reinforced neoprene bellows.
2. Maximum Natural Frequency: 3 Hz.
3. Operating Pressure Range: 25 to 100 psig (172 to 690 kPa).
4. Burst Pressure: At least three times the manufacturer's published maximum operating pressure.
5. Leveling Valves: Minimum of 3 required to maintain leveling within plus or minus 1/8 inch (3 mm).

D. Restrained Air Mounts: Housed compressed-air bellows.

1. Assembly: Upper and lower steel sections connected by a replaceable, flexible, nylon-reinforced neoprene bellows and spring, with angle-iron frame having vertical-limit stops and channel-section top with leveling adjustment and attachment screws.
2. Maximum Natural Frequency: 3 Hz.
3. Operating Pressure Range: 25 to 100 psig (172 to 690 kPa).
4. Burst Pressure: At least three times the manufacturer's published maximum operating pressure.
5. Leveling Valves: Minimum of 3 required to maintain leveling within plus or minus 1/8 inch (3 mm).

2.4 RESTRAINED VIBRATION ISOLATION ROOF-CURB RAILS

A. Available Manufacturers:

B. Manufacturers:

1. Amber/Booth Company, Inc.
2. California Dynamics Corp.
3. Isolation Technology, Inc.
4. Kinetics Noise Control, Inc.
5. Mason Industries, Inc.
6. Vibration Eliminator Co., Inc.
7. Vibration Isolation Co., Inc.

C. Description: Factory-assembled, fully enclosed, insulated, air- and watertight curb rail designed to resiliently support equipment and to withstand 125-mph (56-m/s) wind impinging laterally against side of equipment.

D. Lower Support Assembly: Sheet-metal "Z" section containing adjustable and removable steel springs that support upper floating frame. Upper frame shall provide continuous support for equipment and shall be captive to resiliently resist wind and seismic forces. Lower support assembly shall have a means for attaching to building structure and a wood nailer for attaching roof materials, and shall be insulated with a minimum of 2 inches (50 mm) of rigid, glass-fiber insulation on inside of assembly.

E. Spring Isolators: Adjustable, restrained spring isolators shall be mounted on 1/4-inch- (6-mm-) thick, elastomeric vibration isolation pads and shall have access ports, for level adjustment, with removable waterproof covers at all isolator locations. Isolators shall be located so they are accessible for adjustment at any time during the life of the installation without interfering with the integrity of the roof.

1. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.

    a. Housing: Steel with resilient vertical-limit stops and adjustable equipment mounting and leveling bolt.
    b. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
    c. Minimum Additional Travel: 50 percent of the required deflection at rated load.
    d. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
    e. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

    a. Material:Standard neoprene.
    b. Durometer Rating: 70.
    c. Number of Layers: 3.

F. Snubber Bushings: All-directional, elastomeric snubber bushings at least 1/4 inch (6 mm) thick.

G. Water Seal: Galvanized sheet metal with EPDM seals at corners, attached to upper support frame, extending down past wood nailer of lower support assembly, and counterflashed over roof materials.

2.5 SEISMIC-RESTRAINT DEVICES

A. Available Manufacturers:

B. Manufacturers:

1. Amber/Booth Company, Inc.
2. B-Line Systems, Inc.
3. California Dynamics Corp.
4. Kinetics Noise Control, Inc.
5. Loos & Co., Inc.; Cableware Technology Division.
6. Mason Industries, Inc.
7. TOLCO Incorporated.
8. Unistrut Diversified Products Co.; Wayne Manufacturing Division.
9. Vibration Eliminator Co., Inc.
10. Vibration Isolation Co., Inc.
11. Vibration Mountings & Controls/Korfund.

C. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer of 60, plus or minus 5, with a flat washer face.

D. Seismic Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
2. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer of 60, plus or minus 5.

E. Restraining Cables: Galvanized steel aircraft cables with end connections made of steel assemblies that swivel to final installation angle and utilize two clamping bolts for cable engagement.

F. Anchor Bolts: Seismic-rated, drill-in, and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488/E 488M.

2.6 VIBRATION ISOLATION EQUIPMENT BASES

A. Available Manufacturers:

B. Manufacturers:

1. Amber/Booth Company, Inc.
2. California Dynamics Corp.
3. Isolation Technology, Inc.
4. Kinetics Noise Control, Inc.
5. Mason Industries, Inc.
6. Vibration Eliminator Co., Inc.

7. Vibration Isolation Co., Inc.

C. Steel Base: Factory-fabricated, welded, structural-steel bases and rails.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch (25-mm) clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails. Include supports for suction and discharge elbows for pumps.
2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel angles on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

D. Inertia Base: Factory-fabricated, welded, structural-steel bases and rails ready for field-applied, cast-in-place concrete.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch (25-mm) clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails. Include supports for suction and discharge elbows for pumps.
2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel angles on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

2.7 FACTORY FINISHES

A. Manufacturer's standard prime-coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be electrogalvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install roof curbs, equipment supports, and roof penetrations as specified in Division 7 Section "Roof Accessories."

B. Install thrust limits at centerline of thrust, symmetrical on either side of equipment.

C. Install seismic snubbers on isolated equipment. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.

D. Install restraining cables at each trapeze and individual pipe hanger. At trapeze anchor locations, shackle piping to trapeze. Install cables so they do not bend across sharp edges of adjacent equipment or building structure.

E. Install steel angles or channel, sized to prevent buckling, clamped with ductile-iron clamps to hanger rods for trapeze and individual pipe hangers. At trapeze anchor locations, shackle piping to trapeze. Requirements apply equally to hanging equipment. Do not weld angles to rods.

F. Install resilient bolt isolation washers on equipment anchor bolts.

3.3 EQUIPMENT BASES

A. Fill concrete inertia bases, after installing base frame, with 3000-psi (20.7-MPa) concrete; trowel to a smooth finish.

1. Cast-in-place concrete materials and placement requirements are specified in Division 3.

B. Concrete Bases: Anchor equipment to concrete base according to supported equipment manufacturer's written instructions for seismic codes at Project site.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
2. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
6. Cast-in-place concrete materials and placement requirements are specified in Division 3.

3.4 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified testing agency to perform the following field quality-control testing:

B. Testing: Engage a qualified testing agency to perform the following field quality-control testing:

C. Testing: Perform the following field quality-control testing:

1. Isolator seismic-restraint clearance.
2. Isolator deflection.

3. Snubber minimum clearances.
4. Air-Mounting System Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
5. Air-Mounting System Operational Test: Test the compressed-air leveling system. Remove malfunctioning units, replace with new units, and retest.
6. Test and adjust air-mounting system controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Air-Mounting System Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping connections. Report results in writing.

1. Isolator seismic-restraint clearance.
2. Isolator deflection.
3. Snubber minimum clearances.
4. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
5. Operational Test: Test the compressed-air leveling system. Remove malfunctioning units, replace with new units, and retest.
6. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

A. Adjust isolators after piping systems have been filled and equipment is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch (6-mm) movement during start and stop.

D. Adjust air spring leveling mechanism.

E. Adjust active height of spring isolators.

F. Adjust snubbers according to manufacturer's written recommendations.

G. Adjust seismic restraints to permit free movement of equipment within normal mode of operation.

H. Torque anchor bolts according to equipment manufacturer's written recommendations to resist seismic forces.

3.6 CLEANING

A. After completing equipment installation, inspect vibration isolation and seismic-control devices. Remove paint splatters and other spots, dirt, and debris.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-mounting systems.

3.8 VIBRATION ISOLATOR AND SEISMIC-RESTRAINT SCHEDULE

1. Supported or Suspended Equipment: Refer to schedules.

END OF SECTION 23 05 48

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 SUMMARY:

This Section specifies the requirements and procedures total mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.

Test, adjust, and balance the following mechanical systems:

Supply air systems, all pressure ranges; including double duct systems;
Hydronic systems;
HVAC units
Exhaust air systems;

Test systems for proper sound and vibration levels.

1.3 DEFINITIONS:

Systems testing, adjusting, and balancing is the process of checking and adjusting all the building environmental systems to produce the design objectives. It includes:

the balance of air and water distribution;
adjustment of total system to provide design quantities;
electrical measurement;
verification of performance of all equipment and automatic controls;
sound and vibration measurement.

A. Test: To determine quantitative performance of equipment.

B. Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment (e.g., reduce fan speed, throttling).

C. Balance: To proportion flows within the distribution system (submains, branches, and terminals) according to specified design quantities.

D. Procedure: Standardized approach and execution of sequence of work operations to yield reproducible results.

E. Report forms: Test data sheets arranged for collecting test data in logical order for submission and review. These data should also form the permanent record to be used as the basis for required future testing, adjusting, and balancing.

F. Terminal: The point where the controlled fluid enters or leaves the distribution system. These are supply inlets on water terminals, supply outlets on air terminals, return outlets on water terminals, and exhaust or return inlets on air terminals such as registers, grilles, diffusers, louvers, and hoods.

G. Main: Duct or pipe containing the system's major or entire fluid flow.

H. Submain: Duct or pipe containing part of the systems' capacity and serving two or more branch mains.

I. Branch main: Duct or pipe serving two or more terminals.

J. Branch: Duct or pipe serving a single terminal.

1.4 SUBMITTALS:

Agency Data:

Submit proof that the proposed testing, adjusting, and balancing agency meets the qualifications specified below.

Engineer and Technicians Data:

Submit proof that the Test and Balance Engineer assigned to supervise the procedures, and the technicians proposed to perform the procedures meet the qualifications specified below.

Procedures and Agenda: Submit a synopsis of the testing, adjusting, and balancing procedures and agenda proposed to be used for this project. After the procedures have been submitted and reviewed, meet with the design team, Owner and the Owner's commissioning agent to review the procedures prior to the start of testing and balancing of any of the systems.

Sample Forms: Submit sample forms, if other than those standard forms prepared by the AABC are proposed.

Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and format specified below:

Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams within operating and maintenance manuals.

Report Contents: Provide the following minimum information, forms and data:

General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency, Contractor, Owner, Architect, Engineer, and Project. Include addresses, and contact names and telephone numbers. Also include a certification sheet containing the seal and name address, telephone number, and signature of the Certified Test and Balance Engineer. Include in this division a listing of the instrumentations used for the procedures along with the proof of calibration.
The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC and NEBB, for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form.

Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

1.5 QUALITY ASSURANCE:

Agency Qualifications:

Employ the services of an independent testing, adjusting, and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust, and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.
An independent testing, adjusting, and balancing agency certified by Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) in those testing and balancing disciplines required for this project, and having at least one Professional Engineer registered in the State in which the services are to be performed, certified by AABC as a Test and Balance Engineer.

Codes and Standards:
AABC: "National Standards For Total System Balance".
NEBB "National Environmental Balancing Bureau".

Pre-Balancing Conference: Prior to beginning of the testing, adjusting, and balancing procedures, schedule and conduct a conference with the Architect/Engineer and representatives of installers of the mechanical systems. The objective of the conference is final coordination and verification of system operation and readiness for testing, adjusting, and balancing.

1.6 PROJECT CONDITIONS:

Systems Operation: Systems shall be fully operational prior to beginning procedures.

1.7 SEQUENCING AND SCHEDULING:

Test, adjust, and balance the air systems before hydronic systems.

Test, adjust and balance air conditioning systems during summer season and heating systems during winter season, including at least a period of operation at outside conditions within 5 deg F wet bulb temperature of maximum summer design condition, and within 10 deg F dry bulb temperature of minimum winter design condition. Take final temperature readings during seasonal operation.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING:

Before operating the system, perform these steps:

A. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.
B. Obtain copies of approved shop drawings of all air handling equipment, outlets (supply, return, and exhaust) and temperature control diagrams.
C. Compare design to installed equipment and field installations.
D. Walk the system from the system air handling equipment to terminal units to determine variations of installation from design.
E. Check filters for cleanliness.

F. Check dampers (both volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.
G. Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a crosscheck with required fan volumes.
H. Determine best locations in main and branch ductwork for most accurate duct traverses.
I. Place outlet dampers in the full open position.
J. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.
K. Lubricate all motors and bearings.
L. Check fan belt tension.
M. Check fan rotation.

3.2 PRELIMINARY PROCEDURES FOR HYDRONIC SYSTEM BALANCING:

Before operating the system perform these steps:

Open valves to full open position. Close coil bypass valves.
Remove and clean all strainers.
Examine hydronic systems and determine if water has been treated and cleaned.
Check pump rotation.
Clean and set automatic fill valves for required system pressure.
Check expansion tanks to determine that they are not air bound and that the system is completely full of water.
Check air vents at high points of systems and determine if all are installed and operating freely (automatic type) or to bleed air completely (manual type).
Set temperature controls so all coils are calling for full flow.
Check operation of automatic bypass valves.
Verify that the correct autoflow cartridges have been installed (check gpm) and measure the differential pressure thru the autoflow valve.
Check and set operating temperatures of chillers to design requirements.
Lubricate all motors and bearings.

3.3 MEASUREMENTS:

Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.

Provide instruments meeting the specifications of the referenced standards.

Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.
Apply instrument as recommended by the manufacturer.

Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.

When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5 percent. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.

Take all reading with the eye at the level of the indicated value to prevent parallax.

Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuation readings.

Take measurements in the system where best suited to the task.

3.4 PERFORMING TESTING, ADJUSTING, AND BALANCING:

Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.

Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.

Patch insulation, ductwork, and housings, using materials identical to those removed.

Seal ducts and piping, and test for and repair leaks.

Seal insulation to re-establish integrity of the vapor barrier.

Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.

Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

3.5 TESTING FOR SOUND AND VIBRATION:

Test and adjust mechanical systems for sound and vibration in accordance with the detailed instructions of the referenced standards.

3.6 RECORD AND REPORT DATA:

Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by the referenced standards, and as approved on the sample report forms.

Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

The T & B report will be considered as a life safety item and therefore needs to be completed, reviewed and approved by the designer of record at the final inspection day and before Certificate of occupancy is granted. The T & B report to include both the air and water balance.

END OF SECTION 23 05 93

SECTION 23 07 00 - MECHANICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

This Section includes pipe, duct, and equipment insulation and electric heating cable. All work must comply with NC Energy Code and ASHRAE 90.1 for thermal performance.

1.3 SUBMITTALS

Product data for each type of mechanical insulation identifying k-value, thickness, and accessories.

1.4 QUALITY ASSURANCE

Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory. **NOTE: All indoor piping and insulation must be listed for installation in a return air plenum in areas served by a VAV system.**

Interior Insulation: ASTM E84- Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

A. Glass Fiber:
   CertainTeed Corporation.
   Knauf Fiberglass GmbH.
   Manville.
   Owens-Corning Fiberglas Corporation.
   USG Interiors, Inc. - Thermafiber Division.

B. Polyisocyanurate:

   Dow Trymer 2000
   Approved equal.

C. Flexible Elastomeric Cellular:

   Armstrong World Industries, Inc.
   Halstead Industrial Products.
   IMCOA.
   Rubatex Corporation.

D. Pre-insulated Piping:
   Insul-pipe Systems, Inc.

Rovanco Corp.
Themacor

2.2 GLASS FIBER

E. Material: Inorganic glass fibers, bonded with a thermosetting resin.

F. Jacket: All-purpose, factory-applied, laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.

G. Board: ASTM C 612, Class 2, semi-rigid jacketed board.

H. Thermal Conductivity: 0.26 average maximum, at 75 deg F mean temperature.

I. Density: 12 pcf average maximum.

J. Blanket: ASTM C 553, Type II, Class F-1, jacketed flexible blankets.

K. Thermal Conductivity: 0.32 average maximum, at 75 deg F mean temperature.

L. Preformed Pipe Insulation: ASTM C 547, Class 1, rigid pipe insulation, jacketed.

M. Thermal Conductivity: 0.26 average maximum at 75 deg F mean temperature.

N. Density: 10 average maximum.

O. Adhesive: Produced under the UL Classification and Follow-up service.

P. Type: Non-flammable, solvent-based.

Q. Service Temperature Range: Minus 20 to 180 deg F.

R. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.

2.3 FLEXIBLE ELASTOMERIC CELLULAR

Material: Flexible expanded closed-cell structure with smooth skin on both sides.

Tubular Materials: ASTM C 354, Type I.

Sheet Materials: ASTM C 354, Type II.

Thermal Conductivity: 0.30 average maximum at 75 deg F.

Coating: Water based latex enamel coating recommended by insulation manufacturer.

POLYISOCYANURATE

ASTM E84 flame/smoke performance of 25/50 or lower and listed for plenum installations.

Insulating material shall be tested and listed for temperature ranges between 35 ° F and 200 ° F.

Insulation shall not require piping to be prime coat or painted unless directed by the manufacturer. Contractor must prime coat all pipe before installing the polyiso to provide additional protection. Comply fully with the mfg. recommendations.

Runouts shall be same insulation.

All insulation shall be covered with vapor retarder film such as Saran 540 and Saran 520 tape. Permeance shall be 0.02.

K-factor 0.19 BTU – in/hr-sf-F at 75 ° F mean temperature.

2.4 PRE-FORMED INSULATION

Material: Carrier pipes shall be sch. 40 black steel, A-53. Fittings shall be joined by fusion welding. Insulation shall be polyurethane with a density of 2.5 lbs/cu.ft. and 1.25 thick. Outer jacket PVC with a thickness of .060 min.

2.5 ADHESIVES

Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.

Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:

Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.
Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

2.6 JACKETS

General: ASTM C 921, Type 1, except as otherwise indicated.
Foil and Paper Jacket: Laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

Water Vapor Permeance: 0.02 perm maximum, when tested according to ASTM E 96.

Puncture Resistance: 50 beach units minimum, when tested according to ASTM D 781.

PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil-thick, high-impact, ultra-violet-resistant PVC.

Adhesive: As recommended by insulation manufacturer.

Aluminum Jacket: ASTM B 209, 3003 Alloy, H-14 temper, factory cut and rolled to indicated sizes.

Finish and Thickness: Corrugated finish, 0.010 inch thick.

Moisture Barrier: 1-mil, heat-bonded polyethylene and kraft paper.

Elbows: Preformed 45-degree and 90-degree, short- and long-radius elbows, same material, finish, and thickness as jacket.

ALL Exterior piping (chilled water and refrigerant) shall have a sealed aluminum jacket.

2.7 ACCESSORIES AND ATTACHMENTS

Glass Cloth and Tape: Woven glass fiber fabrics, plain weave, presized a minimum of 8 ounces per sq. yd.

Tape Width: 4 inches.

Cloth Standard: MIL-C-20079H, Type I.

Tape Standard: MIL-C-20079H, Type II.

Bands: 3/4-inch wide, in one of the following materials compatible with jacket:

Aluminum: 0.007 inch thick.

Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

2.8 SEALING COMPOUNDS

Vapor Barrier Compound: Water-based, fire-resistive composition.

Water Vapor Permeance: 0.08 perm maximum.

Temperature Range: Minus 20 to 180 deg F.

Weatherproof Sealant: Flexible-elastomer-based, vapor-barrier sealant designed to seal metal joints.

Water Vapor Permeance: 0.02 perm maximum.
Temperature Range: Minus 50 to 250 deg F.

Color: Aluminum.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each mechanical system.

Install vapor barriers on insulated pipes, ducts, and equipment having surface operating temperatures below 60 deg F.

Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.

Install insulation with smooth, straight, and even surfaces.

Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.

Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.

Seal Ends: Except for flexible elastomeric insulation, taper ends at 45 degree angle and seal with lagging adhesive. Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.

Apply adhesives and coatings at manufacturer's recommended coverage-per-gallon rate.

Keep insulation materials dry during application and finishing.

3.2 PIPE INSULATION INSTALLATION, GENERAL

Tightly butt longitudinal seams and end joints. Bond with adhesive.

Apply insulation with integral jackets as follows:

Provide foil and paper jackets on concealed piping, add 8 oz. canvas jacket pasted on where exposed, provide aluminum jacket on exterior. Pull jacket tight and smooth.
Cover circumferential joints with butt strips, at least 3-inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.

Longitudinal Seams: Overlap seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches on center.

Exception: Do not staple longitudinal laps on insulation applied to piping systems with surface temperatures at or below 35 deg F.

Vapor Barrier Coatings: Where vapor barriers are indicated apply on seams and joints, over staples, and at ends butt to flanges, unions, valves, and fittings.

At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating.

Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.

Flanges, Fittings, and Valves - Interior Exposed and Concealed: Coat pipe insulation ends with vapor barrier coating. Apply premolded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.

Use same material and thickness as adjacent pipe insulation. Overlap nesting insulation by 2 inches or 1-pipe diameter, which ever is greater.
Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.
Insulate elbows and tees smaller than 3-inches pipe size with premolded insulation.
Insulate elbows and tees 3 inches and larger with premolded insulation or insulation material segments. Use at least 3 segments for each elbow.

3.3 GLASS FIBER PIPE INSULATION INSTALLATION

Bond insulation to pipe with lagging adhesive.
Seal exposed ends with lagging adhesive.

Seal seams and joints with vapor barrier compound.

3.4 FLEXIBLE ELASTOMERIC CELLULAR PIPE INSULATION INSTALLATION

Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.

Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.

Miter cut materials to cover soldered elbows and tees.

Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

3.5 PRE-FORMED PIPE INSULATION

Insulation at each end of each length of pipe shall be protected with an end seal bonded both to the carrier pipe and the outer jacket. Piping cuts made in the field must be provided with end-seals equal to factory type.

Fittings and joints on straight runs shall be field insulated with pre-cut polyurethane half-sections of the same thickness as the adjacent pipe, wired in place with all voids being eliminated. Vapor barrier jacketing material for fittings and joints shall be of the same material and thickness as the pipe jacketing. Installation shall be installed as per manufacturer's written instructions.
For additional corrosion protection for the carrier pipe and fittings a heavy coat of asphalt mastic is to be applied directly to the exposed portions of all steel pipe and fittings after specified leak testing has been performed and before field insulation kits are installed.

Contractor shall include in his price cost for manufacturers area representative to inspect installation prior to back-filling. Representation shall observe hydrostatic test and submit report to engineers.

Back-filling shall be carefully done with a layer of clean washed sand, 6" thick, completely surrounding the buried pipes.

3.6 EQUIPMENT INSULATION INSTALLATION, GENERAL

Install board and block materials with a minimum dimension of 12 inches and a maximum dimension of 48 inches.

Groove and score insulation materials as required to fit as closely as possible to the equipment and to fit contours of equipment. Stagger end joints.

Insulation Thicknesses Greater than 2 Inches: Install insulation in multiple layers with staggered joints.

Bevel insulation edges for cylindrical surfaces for tight joint.

Secure sections of insulation in place with wire or bands spaced at 9-inch centers, except for flexible elastomeric cellular insulation.

Protect exposed corners with corner angles under wires and bands.

Manholes, Handholes, and Information Plates: Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.

Removable Insulation: Install insulation on components that require periodic inspecting, cleaning, and repairing for easy removal and replacement without damage to adjacent insulation.

Finishing: Except for flexible elastomeric cellular insulation, apply 2 coats of vapor barrier compound to a minimum thickness of 1/16 inch. Install a layer of glass cloth embedded between layers.

3.7 GLASS FIBER EQUIPMENT INSULATION INSTALLATION

Secure insulation with anchor pins and speed washers.

Space anchors at maximum intervals of 18 inches in both directions and not more than 3 inches from edges and joints.

Apply a smoothing coat of insulating and finishing cement to finished insulation.

3.8 FLEXIBLE ELASTOMERIC CELLULAR EQUIPMENT INSULATION INSTALLATION

Groove and core insulation material as required to fit closely as possible to contour of equipment.

Apply full coverage of adhesive to the surfaces of the equipment and to the insulation.

Butt insulation joints firmly together and apply adhesive to insulation edges at joints.

3.9 DUCT INSULATION

Install block and board insulation as follows:

Adhesive and Band Attachment: Secure block and board insulation tight and smooth with at least 50 percent coverage of adhesive. Install bands spaced 12 inches apart. Protect insulation under bands and at exterior corners with metal corner angles. Fill joints, seams, and chipped edges with vapor barrier compound.
Speed Washers Attachment: Secure insulation tight and smooth with speed washers and welded pins. Space anchor pins 18 inches apart each way and 3 inches from insulation joints. Apply vapor barrier coating compound to insulation in contact, open joints, breaks, punctures, and voids in insulation.

Blanket Insulation: Install tight and smooth. Secure to ducts having long sides or diameters as follows:

Smaller Than 24 Inches: Bonding adhesive applied in 6-inch-wide transverse strips on 12-inch centers.

24 Inches and Larger: Anchor pins spaced 12 inches apart each way. Apply bonding adhesive to prevent sagging of the insulation.

Overlap joints 3 inches.

Seal joints, breaks, and punctures with vapor barrier compound.

NOTE: No interior duct insulation will be allowed except for double wall duct and transfer ducts..

3.10 JACKETS

Foil and Paper Jackets (FP): Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1-1/2-inch laps at longitudinal joints and 3-inch-wide butt strips at end joints.

Seal openings, punctures, and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound.

3.11 FINISHES

Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed insulation.

3.12 APPLICATIONS

General: Materials and thicknesses are specified in schedules at the end of this Section.

Unless otherwise indicated, insulate the following piping systems:

Hydronic piping (35 to 99 deg F).
Hydronic piping (100 to 250 deg F).

Equipment: Unless otherwise indicated, insulate the following indoor equipment:

Chilled water equipment, tanks, pumps.
Heating water equipment, tanks, and pumps.

Duct Systems: Unless otherwise indicated, insulate the following duct systems:

Interior concealed supply, return and outside air ductwork. Interior exposed supply, return and outside air ductwork.
Interior exposed and concealed supply fans, air handling unit casings and outside air plenums.

All exterior exposed chilled water insulation shall be covered with an aluminum jacket installed as per manufacturers written instructions. All underground chilled and hot water piping shall be insulated with pre-formed pipe insulation.

All exterior exposed refrigerant piping insulation shall be covered with an aluminum jacket.

General: Abbreviations used in the following schedules include:
Field-Applied Jackets: P - PVC, K - Foil and Paper, A - Aluminum, SS - Stainless Steel.

Pipe Sizes: NPS - Nominal Pipe Size.

CHILLED WATER/DUAL TEMPERATURE
(35 TO 210 DEG F) CONCEALED

PIPE SIZES (NPS)	MATERIALS	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD-APPLIED JACKET
1/2" TO 3"	POLYISOCYANURATE	1-1/2	YES	NONE
3" to 6"	POLYISOCYANURATE	1-1/2	YES	NONE

NOTE: Interior exposed pipe insulation shall have color coded PVC jacket. The jacket shall be applied over the vapor retarder film (permeance 0.02). Prime coat before covering.

INTERIOR HOT WATER (100 TO 250 DEG F)
CONCEALED

PIPE SIZES (NPS)	MATERIALS	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD-APPLIED JACKET
1/2" TO 4"	GLASS FIBER	2	NO	NONE
5" TO 10"	GLASS FIBER	2	NO	NONE
1/2" TO 1-1/4" ONLY	FLEXIBLE ELASTOMERIC	3/4	NO	NONE

NOTE: Interior exposed pipe insulation shall have color coded PVC jacket.

EQUIPMENT INSULATION SCHEDULES

INTERIOR EXPOSED DOMESTIC COLD WATER EQUIPMENT, TANKS, AND PUMPS

MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD-APPLIED JACKET
GLASS FIBER	BLOCK OR BOARD	1	YES	(P)
FLEXIBLE ELASTOMERIC	SHEET	3/4	YES	NONE

INTERIOR EXPOSED DOMESTIC HOT WATER EQUIPMENT, TANKS AND PUMPS

MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD-APPLIED JACKET
GLASS FIBER	BLOCK	2	NO	(A)

INTERIOR EXPOSED CHILLED/DUAL TEMPERATURE WATER EQUIPMENT, TANKS, AND PUMPS

MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD-APPLIED JACKET
POLYISOCYANURATE	BLOCK	1-1/2	YES	(A or P)

DUCT SYSTEMS INSULATION SCHEDULE

INTERIOR CONCEALED HVAC SUPPLY AND RETURN DUCTS AND PLENUMS

MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD-APPLIED JACKET
GLASS FIBER	BLANKET	2	YES	NONE

INTERIOR EXPOSED HVAC SUPPLY AND RETURN DUCTS AND OUTSIDE AIR PLENUMS

MATERIAL	FORM	THICKNESS IN INCHES	VAPOR BARRIER REQ'D	FIELD-APPLIED JACKET
GLASS FIBER	RIGID	1	YES	8 oz. canvas

Refrigerant Piping: ¾" flexible elastomeric. Cover exterior with aluminum jacket.
Condensate Piping: ½" flexible elastomeric.

PIPE INSULATION COLOR SCHEDULE

CHILLED WATER SUPPLY	DARK BLUE
CHILLED WATER RETURN	LIGHT BLUE
HOT WATER SUPPLY	DARK RED
HOT WATER RETURN	LIGHT RED
DOMESTIC WATER MAKE UP	GREEN

Note: Insulation requirements above are the minimum allowed. Increase as required to meet current energy code requirements.

END OF SECTION 23 07 00

SECTION 23 08 60 – BUILDING AUTOMATION SYSTEM (BAS) COMMISSIONING

1.1 GENERAL

a. Work Included

BAS Start-Up and Functional Performance Testing.

Validation of proper and thorough installation of BAS and associated equipment.

Generic Start-Up Documentation for BAS.

Development of final Start-Up Documentation for BAS.

Functional Performance Testing of BAS.

Coordination of BAS-related training.

Documentation of BAS Operation and Maintenance Documentation.

1.2 GENERAL DESCRIPTION

This section defines responsibilities of the Building Automation System Contractor to commission the BAS.

Commissioning (Cx) is the process of ensuring that (i) all building systems are installed and perform interactively according to the design intent; (ii) that systems are efficient and cost effective and meet the Owner's operational needs; (iii) that the installation is accurately documented; and (iv) that the Operators are adequately trained. Commissioning serves as a tool to minimize post-occupancy operational problems, and establishes testing and communication protocols to advance the building systems from installation to optimized, fully-dynamic operation.

Commissioning Authority (CxA) shall work with the Contractor and the design engineers to direct and oversee the Cx process and perform Functional Performance Testing.

The Commissioning Plan outlines the Cx process beyond the Construction Contract, including design phase activities and design team/owner responsibilities. The specification Sections dictate all requirements of the commissioning process relative to the construction contract. The Cx Plan is not part of the construction contract, although it is available for reference at the request of the Contractor.

NOTE: THE BAS VENDOR SHALL PROVIDE THE COMMISSIONING FOR THE CONTROLS ON THIS PROJECT.

1.3 SCOPE

The scope of Commissioning on this project shall include the entire BAS system.

1.4 Related Work and Documents

The Cx process references many related Sections, particularly Section 01 91 00 - General Commissioning. It is important for all Contractors subject to the Cx process to be familiar with Section 01 91 00.

Refer to Section 01 91 00 for a complete list of Sections on Related Work.

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.5 DEFINITIONS and Abbreviations

Refer to Section 019100 for a complete list of Definitions and Abbreviations.

POT (Portable Operators Terminal): Portable operator workstation (typically a laptop computer) that has BAS software loaded and the capability to access, program, and edit the BAS.

HHD (Hand-Held Device): Portable device (typically with limited functionality) that is used to access components of the BAS. May be a standard PDA or proprietary device/interface.

1.6 REFERENCE STANDARDS

Refer to Section 01 91 00 for a complete list of Reference Standards.

1.7 CONTRACTOR RESPONSIBILITIES

General responsibilities of the BAS Contractor (BAC) are specified in Section 019100. The following indicate additional specific responsibilities of the BAS Contractor.

Assist CxA in verification and Functional Performance Testing. Assistance will typically include the following:

Establish trend logs of system operation as specified herein.

Manipulate systems and equipment to facilitate Functional Performance Testing as outlined in Section 019110. Typically, this will only be for initial samples of like systems.

Provide POTs or operator workstations in locations convenient to testing activities as specified below.

Provide CxA with appropriate passwords, keys, and access to control panels and workstations.

Where control systems do not allow a test mode or the overriding of physical input values for testing, program an interim virtual point for all inputs that can be used to represent the point and be overridden for testing.

Software Optimizations: Provide a control technician to work at the direction of the CxA for software optimization assistance for a minimum of 24 hours. Refer to Part 3 for a description of the software optimization.

Controls Parameter Matrix: Provide a form summarizing all setpoints and alarm parameters and alarming strategies for the Owner to review and accept. Organize a meeting to discuss the desired initial setpoints and alarm parameters. Contractor shall enter the requested setpoints and alarm parameters at completion of start up and record the applicable settings in the prefunctional documentation.

Final Systems Operation Training: The BAC shall train the Owner and Operators on whole-building operation and use of the BAS. This training shall focus primarily on BAS control of building systems and operation and its impact on building performance, and shall be conducted after Functional Completion. Additional information is provided in Section 019100.

1.8 SEQUENCING

Refer to Section 019100.

The following list outlines the general sequence of events for Commissioning of the BAS.

Construction Phase:

Collaborate on construction scheduling.

Submit Product data and Shop Drawings, and receive approval.

Meet with Cx Team to coordinate with all trades.

Submit Control Logic Documentation, and receive approval.

Begin BAS installation.

- Submit refinement of generic Start-Up Documents incorporating manufacture-specific start-up requirements accompanied by manufacturers pre-printed start-up forms for all equipment provided by the BAS Contractor
- Receive BAS Start-Up Documents approval from CxA.
- Submit Training Plan content.
- Receive approval of Training Plan content.
- Provide alarm list and receive approval.
- Provide sample graphics and receive approval.
- Complete BAS installation.
- Place systems under BAS control.
- Enter alarms as approved by Owner.
- Complete BAS graphics.
- Perform BAS system start up and complete Start-Up Documentation.
- Submit completed BAS Start-Up Documentation.
- Prepare and initiate trend log data storage and format trend graphs.
- Train Owner on BAS operation and maintenance.
- Formal BAS System Turn-Over Meeting
- Submit commissioning BAS Software/Access and provide Level 5 (monitoring, point override/test, and setpoint adjustment) password access to Owner and CxA.
- Receive BAS Start-Up Documentation approval and approval to schedule BAS demonstration of completeness.
- Demonstrate systems to CxA and Owner.
- Submit trend logs in format specified.
- Receive FPT or BAS demonstration approval and approval to schedule Acceptance Phase.

Acceptance Phase

- Two-week BAS Observation Period to witness stable BAS operation.
- Receive Observation Period approval which enables start of Functional Performance Testing.
- CxA performs Functional Performance Testing and BAS Contractor participates in initial samples.
- Receive Functional Completion approval for the BAS.

Warranty Phase

- Provide administrator access password access to Owner.
- Train Owner on final sequences and modes of operation (*Final Systems Operation Training*).
- Revise and re-submit record drawings and O&M manuals.
- Install framed control drawings.
- Final Completion.
- Opposite-season operational test and Functional Performance Testing.
- Receive opposite-season operational test and FPT approval.
- Revise and re-submit record drawings and O&M manuals.
- Update framed control drawings.
- Complete owner training.
- End of Warranty Period.

PART 2 - PRODUCTS

2.1 INSTRUMENTATION

General: All testing equipment used by any Party shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:

Temperature sensors and digital thermometers shall have a certified calibration within the past year and a resolution of +/- 0.1°F.

Pressure sensors shall have an accuracy of +/- 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

All equipment shall be calibrated according to the manufacturer's recommended intervals. Calibration tags shall be affixed or certificates readily available.

Standard Testing Instrumentation: Standard instrumentation used for testing temperatures, humidity, and pressure differential in air and water systems related to functional testing shall be provided by the contactor.

Special Tools: Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and turned over to the Owner upon project completion.

2.2 Web-Based Commissioning Portal

General: The Cx Portal ('Portal') is a Web-based Internet hub used to electronically collaborate and coordinate activities and deliverables throughout the Cx process. The Portal is hosted by the CxA and shall be accessible to all Parties participating in the Cx program. The Portal provides a common location to store Start-Up Documentation, Functional Performance Tests and results, project documents and deliverables. It also serves as a collaborative email hub to facilitate, automate, and track communications between Parties relating to the Cx process. The Portal uses a hierarchical object tree to represent building systems, components and devices. From this object tree, one can access associated information at and below the applicable level. All applicable elements of information are associated with the object tree. The Portal facilitates either completing information directly via the software or by printing forms to fill out in the field.

Participation: All general and major subcontractors participating in the Cx process shall participate in the use of the Portal to document the Cx procedures.

PART 3 - EXECUTION

3.1 BAS Start-Up TESTING, ADJUSTING, CALIBRATION

BAS work and/or systems shall be fully functioning prior to Demonstration and Acceptance Phase. Contractor shall start, test, adjust, and calibrate all work and/or systems under this contract, as described below:

Inspect the installation of all devices. Review the manufacturer's installation instructions and validate that the device is installed in accordance with them.

Verify proper electrical voltages and amperages, and verify that all circuits are free from faults.

Verify integrity/safety of all electrical connections.

Coordinate with TAB Contractor to obtain and with CxA to fine tune control settings that are determined from balancing procedures. Record the following control settings as obtained from TAB Contractor, and note any TAB deficiencies in the BAS Start-Up Documentation:

Optimum duct static pressure setpoints for VAV air handling units.

Minimum outside air damper settings for air handling units.

Optimum differential pressure setpoints for variable speed pumping systems.

Calibration parameters for flow control devices such as VAV boxes and flow measuring stations. BAS Contractor shall provide hand held device as a minimum to the TAB and CxA to facilitate calibration. Connection for any given device shall be local to the device (i.e., at the VAV box or at the thermostat). HHD or POT shall allow querying and editing of parameters required for proper calibration and Start-Up.

Test, calibrate, and set all digital and analog sensing and actuating devices. Calibrate each instrumentation device by making a comparison between the BAS display and the reading at the device, using an instrument traceable to the National Bureau of Standards, which shall be at least twice as accurate as the device to be calibrated (e.g., if field device is +/-0.5% accurate, test equipment shall be +/-0.25% accurate over same range). Record the measured value and displayed value for each device in the BAS Start-Up Documentation.

Check and set zero and span adjustments for all transducers and transmitters.

For dampers and valves:

Check for adequate installation including free travel throughout range and adequate seal.

Where control loops are sequenced, check for proper control without overlap

For actuators:

Check to insure that device seals tightly when the appropriate signal is applied to the operator.

Check for appropriate fail position, and that the stroke and range is as required and coordinated with the programmed ranges when it is operating under normal conditions.

For pneumatic operators, adjust the operator spring compression as required to achieve close off. If positioner or volume booster is installed on the operator, calibrate per manufacturer's procedure to achieve spring range indicated. Check split range positioners to verify proper operation. Record settings for each device.

Check the stroke and range under actual loading conditions and validate that they correlate with programmed values.

For sequenced electronic actuators, calibrate per manufacturer's instructions to required ranges.

Check each digital control point by making a comparison between the control command at the CU and the status of the controlled device. Check each digital input point by making a comparison of the state of the sensing device and the OI display. Record the results for each device.

For outputs to reset other manufacturers devices (such as VSDs) and feedback from them, calibrate ranges to establish proper parameters. Coordinate with representative of the respective manufacturer and obtain their approval of the installation.

Verify proper sequences by using the approved Start-Up Documentation to record results. Verify proper sequence and operation of all specified functions.

Verify that all safety devices trip at appropriate conditions. Adjust setpoints accordingly.

Tune all control loops to obtain the fastest stable response without hunting, offset or overshoot. Record tuning parameters and response test results for each control loop in the BAS Start-Up Documentation. Except from a start-up, maximum allowable variance from setpoint for controlled variables under normal load fluctuations shall be as follows. Within 3 minutes of any step-change (for which the

system has the capability to respond) in the control loop, the following tolerances shall be maintained (exceptions noted):

Duct air temperature: ±1°F.

Zone temperature: ±3°F within 3 minutes and control within ±1.5°F

Chilled water temperatures: ±1°F

Hot water temperatures: ±2°F.

Duct air pressure: ± 0.2" w.g.

Water pressure: ±1 psid

Duct relative humidity: ±3% when adding humidity

Zone relative humidity: ±5% when adding humidity to control

Terminal air flow control: ±5% of setpoint. This includes all VAV terminal control with supply or exhaust ventilation.

For communication interfaces and BAS control panels:

Ensure devices are properly installed with adequate clearance for maintenance and with clear labels in accordance with the record drawings.

Ensure that terminations are safe, secure and labeled in accordance with the record drawings.

Check power supplies for proper voltage ranges and loading.

Ensure that wiring and tubing are run in a neat and workman-like manner, either bound or enclosed in trough.

Check for adequate signal strength and acceptable bandwidth utilization on communication networks.

Check for stand-alone performance of controllers by disconnecting the controller from the LAN. Verify the event is annunciated at Operator Interfaces. Verify that the controlling LAN reconfigures as specified in the event of a LAN disconnection.

Ensure that all outputs and devices fail to their proper positions/states.

Ensure that buffered and/or volatile information is held through power outage.

With all system and communications operating normally and all trends functioning, sample and record update/annunciation times for critical alarms fed from the panel to the Operator Interface.

Check for adequate grounding of all BAS panels and devices.

Run self diagnostic routines and ensure they are functional

Check the memory allocation and loading to ensure adequate and excess capacity is available and that it will not affect control functionality.

Coordinate desired initial alarm strategies with Owner's Operators. Set all required alarms and document the initial settings in the start up documentation

Coordinate all initial setpoints with Owner's Operators. Ensure those setpoints are active

For Operator Interfaces:

Verify that all elements on the graphics are functional and are properly bound to physical devices and/or virtual points, and that hot links or page jumps are functional and logical.

Output all specified BAS reports for review and approval.

Verify that the alarm printing and logging is functional and per requirements.

Verify that trend archiving to disk and provide a sample to the CxA for review.

Verify alarm enunciation functionality. Time delay from actual occurrence to the time updated or enunciated on the screen. Ensure it is per the specified requirements.

Verify that real time and historical trends are accessible and viewable in graph format.

Verify that paging/dial out alarm annunciation is functional.

Verify the functionality of remote OIs and that a robust connection can be established consistently.

Verify that required third party software applications required with the bid are installed and are functional.

Demonstrate open protocol and custom third party interfaces reliably communicate and check response time.

Verify response times and screen update and refresh times are per the requirements.

Verify that all custom programs are editable from the OI. Check upload, download, back up and restore capabilities of system configuration information as well as custom programs.

Verify schedules are set up and working.

Verify Owner stipulated security and permissions is set up and functional.

Start up and check out control air compressors and air drying and filtering systems in accordance with the appropriate section and with manufacturer's instructions.

Validate adequate deliver and pressures

Validate adequate redundancy

Validate max run time and cycle time vs manufacturer's recommendations

Validate that routing of the compressed air does not result in condensation at any point in the system when used with the specified drier

Check all PRVs both primary and back up to ensure adequate functionality and maintenance of downstream pressure

Verify proper interface with fire alarm system.]

Verify proper interface with control panels of equipment with self contained controls that are being monitored by the BAS.

Submit Start-Up/prefunctional Documentation. This shall be completed, submitted, and approved prior to demonstration and Acceptance Phase.

3.2 Sensor CHeckout and Calibration

General Checkout: Verify that all sensor locations are appropriate and are away from causes of erratic operation. Verify that sensors with shielded cable are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2°F of each other for temperature and within a tolerance equal to 2% of the reading of each other for pressure. Tolerances for critical applications may be tighter.

Calibration: Calibrate all sensors using one of the following procedures:

Sensors Without Transmitters--Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor at various points across the range. Verify that the sensor reading (via the permanent thermostat, gage or BAS) is within the tolerances specified for the sensor. If not, adjust offset and range, or replace sensor. Where sensors are subject to wide variations in the sensed variable, calibrate sensor within the highest and lowest 20% of the expected range.

Sensors With Transmitters--Standard Application. Disconnect sensor. Connect a signal generator in place of sensor. Connect ammeter in series between transmitter and BAS control panel. Using manufacturer's resistance-temperature data, simulate minimum desired temperature. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter. Repeat for the maximum temperature matching 20 mA to the

potentiometer span or maximum and verify at the OI. Record all values and recalibrate controller as necessary to conform to tolerances. Reconnect sensor. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or BAS) is within the tolerances specified. If not, replace sensor and repeat. For pressure sensors, perform a similar process with a suitable signal generator.

Sensor Tolerance: Sensors shall be within the tolerances specified for the device. Refer to Section 15951.

3.3 Loop Tuning

For all control loops, Contractor shall tune the loops to ensure the fastest stable response without hunting, offset or overshoot with tolerances defined above. Contractor shall introduce upsets to the load when possible to affect response. Otherwise, setpoints can be changed to affect the response.

Generally tune loops during periods of high gain.

Document all parameters either by capturing text, short interval trends, or screen shots of trend graph documenting the final response.

3.4 Coil Valve Leak Check

Verify proper close off of the valves. Ensure the valve seats properly by simulating the maximum anticipated pressure difference across the circuit. Calibrate air temperature sensors on each side of coil to be within 0.5°F of each other. Via the OI, command the valve to close. Energize fans. After 5 minutes observe air temperature difference across coil. If a temperature difference is indicated, and the piping surface temperature entering the coil is within 3°F of the water supply temp, leakage is probably occurring. If it appears that it is occurring, close the isolation valves to the coil to ensure the conditions change. If they do, this validates the valve is not closing. Remedy the condition by adjusting the stroke and range, increasing the actuator size/torque, replacing the seat, or replacing the valve as applicable.

3.5 Valve Stroke Setup and Check

For all valve and actuator positions checked, verify the actual position against the OI readout.

Set pumps to normal operating mode. Command valve closed, verify that valve is closed, and adjust output zero signal as required. Command valve open, verify position is full open and adjust output signal as required. Command valve to a few intermediate positions. If actual valve position doesn't reasonably correspond, replace actuator or add pilot positioner (for pneumatics)

3.6 Alarm Setpoint Coordination

The Contractor shall prepare a list of all conceptual point types and recommend the types and recommended alarming strategies and setpoint for review of CxA and Owner. Owner shall use this alarm list to provide direction to Contractor for alarm strategies and setpoints. Alarm list shall be provided at least two months prior to the first functional test. Contractor shall have alarm setpoints entered prior to functional testing. Omitting an alarm setting, using the wrong strategy, or entering the wrong setpoints will be considered a failure from the perspective of the functional test.

3.7 Graphic Coordination

The Contractor shall prepare all graphics (only one example graphic is required for typical systems like terminal units) with points embedded for review of CxA and Owner. Owner shall use these graphics to provide direction to Contractor for the required final graphic. All final graphics must be complete and active before functional testing. Any deviation

from the approved graphics will be considered a failure from the perspective of the functional test.

3.8 BAS DEMONSTRATION

Demonstrate the operation of the BAS hardware, software, and all related components and systems to the satisfaction of the CxA and Owner. Schedule the demonstration with the Owner's representative 1 week in advance. Demonstration shall not be scheduled until all hardware and software submittals, and the Start-Up Test Report are approved. If the Work fails to be demonstrated to conform with Contract specifications, so as to require scheduling of additional site visits by the CxA for re-demonstration, Contractor shall reimburse Owner for costs of subsequent CxA site visits.

The Contractor shall supply all personnel and equipment for the demonstration, including, but not limited to, instruments, ladders, etc. Contractor supplied personnel must be competent with and knowledgeable of all project-specific hardware, software, and the HVAC systems. All training documentation and submittals shall be at the job site.

Demonstration shall typically involve small representative samples of systems/equipment randomly selected by the Owner and CxA.

The system shall be demonstrated following the same procedures used in the Start-Up Test by using the approved Commissioning Checklists. Demonstration shall include, but not necessarily be limited to, the following:

Demonstrate that required software is installed on BAS workstations. Demonstrate that graphic screens, alarms, trends, and reports are installed as submitted and approved.

Demonstrate that points specified and shown can be interrogated and/or commanded (as applicable) from all workstations, as specified.

Demonstrate that remote dial-up communication abilities are in accordance with these Specifications.

Demonstrate correct calibration of input/output devices using the same methods specified for the start-Up tests. A maximum of 10 percent of I/O points shall be selected at random by CxA and/or Owner for demonstration. Upon failure of any device to meet the specified end-to-end accuracy, an additional 10 percent of I/O points shall be selected at random by CxA for demonstration. This process shall be repeated until 100 percent of randomly selected I/O points have been demonstrated to meet specified end-to-end accuracy.

Demonstrate that all BAS and other software programs exist at respective field panels. The BAS programming and point database shall be as submitted and approved.

Demonstrate that all BAS programs accomplish the specified sequences of operation.

Demonstrate that the panels automatically recover from power failures, as specified.

Demonstrate that the stand-alone operation of panels meets the requirements of these Specifications. Demonstrate that the panels' response to LAN communication failures meets the requirements of these Specifications.

Identify access to equipment selected by CxA. Demonstrate that access is sufficient to perform required maintenance.

Demonstrate that required trend graphs and trend logs are set up per the requirements. Provide a sample of the data archive. Indicate the file names and locations.

BAS Demonstration shall be completed and approved prior to Functional Performance Testing. CxA shall determine if the system is ready for Functional Performance Testing and document any problems requiring Contractor attention.

If the systems are not ready for Functional Performance Testing, Contractor shall correct problems and provide notification to the Owner's representative that all problems have been corrected. The Acceptance Period shall be restarted at a mutually

scheduled time for an additional one week period. This process shall be repeated until CxA issues notice that the BAS is ready for Functional Performance Testing.

Any tests successfully completed during the BAS Demonstration will be recorded as 'Passed' for the Functional Performance Testing and will not have to be re-accomplished.

3.9 Functional Performance Testing

Requirements for assistance with Functional Performance Testing are specified in the Section 01 91 00, Section 23 00 90 and this section. Provide assistance during Functional Performance Testing per the applicable Specifications.

3.10 BAS ACCEPTANCE Phase and observation period

BAS Acceptance Phase: BAS Acceptance Phase consists of the Functional Performance Testing process of the BAS by the CxA and shall begin after approval of the BAS Demonstration and prior to issuance of Substantial Completion. Acceptance Phase for the BAS shall not be scheduled until all HVAC systems are in operation, the Start-Up Documentation has been reviewed, all required cleaning and lubrication has been completed (i.e., filters changed, piping flushed, strainers cleaned, etc.), and TAB report has been submitted and approved.Acceptance Phase and its approval to begin will be performed on a system-by-system basis if mutually agreed upon by Contractor and Owner.

BAS Observation Period: After Functional Performance Testing, the BAS shall be shown to operate properly for 2 weeks without malfunction, without alarm caused by control action or device failure, and with smooth and stable control of systems and equipment in conformance with these specifications. At the end of the two weeks, BAS Contractor shall forward the trend logs to the CxA for review.

During the Acceptance Phase, the Contractor shall maintain a hard copy log of all alarms generated by the BAS. For each alarm received, Contractor shall diagnose the cause of the alarm, and shall list on the log for each alarm, the diagnosed cause of the alarm, and the corrective action taken. If in the Contractor's opinion, the cause of the alarm is not the responsibility of the Contractor, Contractor shall immediately notify the Owner's representative.

During the Acceptance Phase, the Contractor shall maintain all controller network and workstation hardware and software in a state that will allow remote access by CxA to trend logs as specified below.

3.11 Bas Trend requirements

Trends are historical archives on computer disks that document the operation of the systems and equipment. Trends can be time-series (interval) recordings of system I/O parameters or change-of-value (COV) based trends that record when a system value changes by more than a specified threshold.

CxA will analyze trend logs of the system operating parameters to evaluate normal system functionality. The requirements of the trending are specified below. Contractor shall establish these trends, ensure they are being stored properly, and forward the data in electronic format to the CxA or make it accessible on site.

Data shall include a single row of field headings and the data thereafter shall be contiguous. Each record shall include a date and time field. Recorded parameters for a given piece of equipment or component shall be trended at the same time intervals and be presented in a maximum of two separate two dimensional formats with time being the vertical axis and field name being the horizontal axis.. Data shall be forwarded in one of the following formats.

Microsoft Access Database (.mdb)

Microsoft Excel Spreadsheet (.xls)

Comma Separated Value (.csv or .txt), preferably with quotes delimiting text fields and # delimiting date/time fields.

Sample times indicated as COV (±) mean that the changed parameter only needs to be recorded whenever the value changes by the amount listed. When output to the trend file, the latest recorded value shall be listed along with the time increment record. If the BAS does not have the capability to record based on COV, the parameter shall be recorded based on the time interval common to other point trends for the system.

Where available, Contractor shall provide the CxA with required passwords, phone numbers, etc. to allow the CxA access to the trend log data and allow downloading to a remote location. Contractor shall also provide step-by-step written instructions for accessing the data.

Trending Requirements: All I/O points on primary equipment shall be trended throughout the Cx process on 10 min. intervals for analog values and change-of-value for binary values. Trends shall include but are not necessarily limited to the following points:

Outside air temperature

Outside air relative humidity

Outside air enthalpy

Cooling tons

All controlling setpoint that are reset (applies to all equipment)

All sensed hydronic temperatures

All sensed air temperatures and relative humidity measurements on primary equipment

All damper outputs on primary equipment

All valve outputs on primary equipment

All sensed fan volumes (flow) on primary equipment

All inputs and outputs to VSDs

Return (or exhaust) air temperature on each air handler

All safety indications

Status on all primary equipment

All air and water pressures on primary equipment or systems

Zone temperatures

Electricity consumption, where monitored.

Basically, all points on primary equipment and selected sampling of terminal points unless approved otherwise

Trending used to document ongoing FPTs may need to occur at a more frequent interval. Consult with the CxA to determine the required intervals for functional testing and modify intervals as required.

3.13 TREND Graphs

Trend graphs shall be used during Functional Performance Testing to facilitate and document testing. Contractor shall prepare controller and workstation software to display graphical format trends throughout the Acceptance Phase. Trend graphs shall demonstrate compliance with contract documents. Trended values and intervals shall be the same as those specified for the Functional Performance Tests.

Lines shall be labeled and shall be distinguishable from each other by using either different line types or different line colors.

Indicate engineering units of the y-axis values; e.g. degrees F., inches w.c., Btu/lb, percent wide open, etc.

The y-axis scale shall be chosen so that all trended values are in a readable range. Do not mix trended values on one graph if their unit ranges are incompatible.

Trend outside air temperature, humidity, and enthalpy during each period in which any other points are trended.

All points trended for one HVAC subsystem (e.g. air handling unit, chilled water system, etc.) shall be trended simultaneously and on a common trend period. Contractor shall be responsible for enabling all trend points for each monitored system. Trends shall be grouped by system for ease of use.

Making available a single list of all trend points available on the entire project is not sufficient. Provide links to trends applicable to each specific system. Or, provide a link to individual "trend studies" applicable to each system. These shall be available to the Owner at the end of the construction phase.

Each graph shall be clearly labeled with HVAC subsystem title, date, and times.

3.14 Warranty Phase - OPPOSITE SEASON Trending and Testing

Trending: Throughout the Warranty Phase, trend logs shall be maintained as required for the Acceptance Phase. BAS Contractor shall forward archived trend logs to the CxA for review upon CxA request. CxA will review these and notify BAS Contractor of any warranty work required.

Opposite Season Testing: Within 6 months of completion of the Acceptance Phase, CxA shall schedule and conduct Opposite Season Functional Performance Testing. The BAS Contractor shall support this testing and remedy any deficiencies identified.

3.15 SOFTWARE OPTIMIZATION ASSISTANCE

The Contractor shall provide the services of a BAS technician as specified above at the project site to be at the disposal of the CxA. The purpose of this requirement is to make changes, enhancements and additions to control unit and/or workstation software that have been identified by the CxA during the construction and commissioning of the project and that are beyond the specified Contract requirements. The cost for this service shall be included with the bid. Requests for assistance shall be for contiguous or non-contiguous 8-hour days, unless otherwise mutually agreed upon by Contractor, CxA, and Owner. The Owner's representative shall notify Contractor 2 days in advance of each day of requested assistance.

The BAS technician provided shall be thoroughly trained in the programming and operation of the controller and workstation software. If the BAS technician provided cannot perform every software task requested by the CxA in a timely fashion, Contractor shall provide additional qualified personnel at the project site as requested by the CxA to meet the total specified requirement.

END OF SECTION 23 08 60

SECTION 230900 – AUTOMATIC TEMPERATURE CONTROLS

PART 1 GENERAL

This specification is a performance specification. All control vendors submitting pricing must be able to demonstrate compliance to the specification or be deemed unacceptable.

Related section 01 23 00 for owner preferred alternate M-1.

APPROVED CONTROL SYSTEM CONTRACTORS

Alerton Controls
The Trane Company, Tracer Summit
Schneider Electric

1.1 WORK INCLUDED

SUMMARY – The scope of work is an extension to the existing Facilities Management System. The DDC control system specified herein shall communicate over the existing network using distributed Work Stations to control the respective HVAC system. The DDC control system specified herein shall be 100% compatible and shall be 100% operational with the existing Alerton Central Office Web Supervisor that is owned and operated by Guilford County. This includes but not limited to full interface with the existing graphic software resident on the central server. The DDC control system specified herein shall adhere to Guilford County standards of communication firewalls and remote system access.

Furnish all labor, materials, equipment, and service necessary for a complete and operating temperature control system, utilizing Direct Digital Controls, electronic interfaces and actuation devices, as described herein.

All labor, material, equipment and software necessary to meet the requirements of the system, as specified herein and as shown on the drawings, shall be included. Drawings are diagrammatic only. Equipment and labor not specifically referred to herein or on the plans that are required to meet the functional intent, shall be provided without additional cost to the Owner.

All brand and product names are trademarks or registered trademarks of their respective companies. The manufacturers that are listed describe the quality of work that the owner has and requires the same or better on this project. The authority of interpretation is described in the General Conditions.

The HVAC Mechanical Contractor shall supply control equipment manufactured by one of the approved control suppliers that has equipment installed on campus and their names are listed herein.

The control contractor shall include installation of conduit and thin - wire cable from the building's DDC Network Controller to the building's closest telecommunications uniform wiring closet. The Owner shall arrange for the connection within the wiring closet. Any material or hardware such as bridges and switches required for the connection shall be installed next to the building's DDC NC.

The cost for all the communication interface hardware and software shall be by the successful control vendor.

The communication protocols must be fully compatible with the County Wide communication specifications. The control contractor must coordinate with the County Telecommunications Group to attain written approval from the Group to operate on the Network.

The control subcontractor shall be responsible for providing a Network Controller (NC) including hardware and/or software, to provide a 100% complete and 100% compatible interface between the County existing

workstations and the LEC systems in order for all new and existing functions to be performed and defined at the respective workstation computer consoles. The system shall be such that all programming shall be downline loaded to the building level system. The (NC) shall interface to the building level DDC system using the County's standardized communication protocol...

1.2 INSTALLATION

All work described in this section shall be installed, wired, circuit tested and calibrated by factory trained electricians and mechanics qualified for this work and in the regular employment of the listed temperature control system manufacturer or its exclusive representative. The installing office shall have a minimum of ten years of installation experience with the Owner. Supervision, calibration and checkout of the system shall be by the employees of the manufacturer or the exclusive representative. The employees of the installing office shall be factory trained. A project supervisor shall be assigned to coordinate all aspects of the project installation. The project supervisor shall have the broad authority to schedule all control work, supervise the installation of control equipment, provide technical consultation, commission system, provide acceptance testing, correct punch list items and train the County operators.

All temperature control and interlock wiring in exposed areas shall be installed in EMT conduit unless otherwise noted. All wiring shall meet local and national codes and shall be plenum rated cable NEC class 2. Conductors shall be supported at 5 feet max intervals directly from the structure. For other than digital signaling use copper wire or control cable #18 minimum (#22 minimum where runs do not exceed 100ft).

All control conductors shall be color-coded. Where conductor passes through a junction box or connect to a device, the conductor, and the box shall be tagged to indicate the circuit and/or terminal number (as marked on the control shop drawings.

There shall be no splices in the control system other than at terminal box. Wire nuts and crimps splices are not permitted.

All terminal block screws shall have pressure wire connectors of the self lifting or box lug type.

The control contractor shall connect to junction box(s) or other termination points provided by the Electrical Contractor. Control contractor shall extend 120 volt power to controllers and actuators as necessary.

Removal of existing controls is part of this contract.

This contractor must submit actual samples of the labels with the control documents for approval before any installation. The owner must see the sample submittal.

Thermostats or sensors mounted on outside walls shall be mounted on 1" minimum thickness, rigid fiberglass insulating base (or equal).

All thermostat or sensor bulbs in water lines shall be installed in separable wells, packed with heat conductive compound. Thermo-o-wells shall be furnished by the control contractor and installed in the piping by the mechanical contractor.

1.3 UNACCEPTABLE BIDS

Bids by control suppliers other than those listed herein shall not be acceptable.

Bids by wholesalers, contractors or franchised dealers or any other firm whose principal business is not that of manufacturing or installing automatic temperature control systems, shall not be acceptable.

The system installed under this contract must be completely (100%) compatible and communicate with existing County Supervisory Server.

1.4 SHOP DRAWINGS / SUBMITTALS

Seven copies of shop drawings of the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturer's catalog data sheets and installation instructions. Shop drawings shall also contain complete wiring and schematic diagrams, software descriptions, calculations, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings. A complete written Sequence of Operation as well as a hard copy graphical depiction (flow chart) of the application control programs shall also be included with the submittal package.

Upon completion of the work, provide a complete set of as-built drawings and application software on standard storage media. Three copies of the Maintenance and operating instruction manuals shall be provided. The manuals shall also contain copies of the as-built hardware and software. The manuals shall also have a section for graphic schematic color printouts. One color copy of each graphic specified shall be included.

Supply to the owner through the proper contracting officers the agreements described below under "warranty".

This contractor shall supply software that allows the owner the ability to print the software flowcharts and store current software. This shall allow the owner to always maintain current software flow charts on all projects connected to their Facility Management System

1.5 MATERIALS

All materials and equipment used shall be standard components, of regular manufacture for this application. All systems and components shall have been thoroughly tested and proven in actual use. All devices shall be UL per regulations. All interface and outboard gear panels shall be UL listed environmental controls. Alerton Controls is the basis of design.

The thermostats should be configured for a 5 degree deadband between heating and cooling setpoints.

Three phase voltage monitor

The three phase voltage monitor will be mounted in a panel inside the main mechanical room and will generate an alarm point for the CCSS anytime there is a loss of phase, improper phase sequence or under voltage. It will also issue an emergency shutdown to all equipment if there is phase loss. The power to all equipment shall be restored automatically once no phase loss is sensed. (Electrical contractor to provide 3 phase breaker and conduit, controls contractor to extend conduit and wiring to PLM and controller- coordinate with EC prior to panel release).

Carbon Dioxide Sensor and Transmitter: Single detectors using solid-state infrared sensors; suitable over a temperature range of 23 to 130 deg F and calibrated for 0 to 2 percent, with continuous or averaged reading, 4- to 20-mA output;, for wall mounting.

Airflow measuring station: Ebtron Gold, Wetmaster Co., Ltd., Kele
Thermal dispersion airflow measurement microprocessor based, DDC interface
Sensor probe: Aluminum alloy tube; thermistore probes

Control Valves

Control valves shall be two-way or three-way pattern as shown constructed for tight shutoff and shall operate satisfactorily against system pressures and differentials. Two-way control valves shall exhibit equal percentage characteristics. Non-equal percentage valve characteristics shall not be acceptable.

Valves with size up to and including 3" shall be "screwed" with 250 psi ANSI pressure body rating; 4" and larger valves shall be 'flanged' configuration. Proportional control valves shall be sized for a maximum pressure drop of 4.0 psig at rated flow (except as noted). Two-position control valves shall be line size and shall be provided with a 250 psi static pressure body rating.

AHU valves shall be globe valves with spring return actuators. Refer to drawings for which units will have two-way or 3-way valves.

Terminal boxes will be ball type valves with stainless steal ball and linear characterizing disc. The last terminal box on the piping run per floor will have a three-way valve. All other terminal boxes on that floor will have two-way valves.

Damper Actuators

Electric damper actuators shall be properly sized to provide sufficient torque to position the damper throughout its operating range.

Motorized Control Dampers

Motorized dampers shall be parallel blade for two-position control and opposed blade for proportional control applications. Dampers over 48" wide shall be equipped with a jack shaft to provide sufficient force throughout the intended operating range.
Control dampers in Admin Penthouse AHU shall be low leakage class I, extruded aluminum airfoil blades and extruded aluminum frame:
max leakage 4 cfm/sf at 1" wg and 8 cfm/sf at 4" wg.
All motorized dampers on outside air shall have spring return to fail "closed".

Air Handling Systems providing heating or cooling air, in excess of 2,000 CFM, shall be equipped with an automatic fire alarm shut-down. Automatic shutdowns shall shut down the air moving equipment when the product of combustion is detected in the duct system or when smoke is detected in areas served by the system. The fire alarm system shall sense the smoke, send the alarm, and index a relay for each piece of air handling equipment that is to be de-energized according to the governing codes. Thus the air handling system shall be electrically (hardwired) interlocked to the local fire alarm system. System shall conform to Owner requirements and NFPA-92A. The Automation System shall report the off-normal status of all the air handling equipment connected to the system. DDC shall monitor fire alarm system and shut down upon activation. System shall randomly restart 5 minutes (adj) after alarms are cleared.

1.6 WARRANTY

The temperature control contractor shall provide a one year warranty that will commence from the point of project acceptance by the Owner.

Any manufacturing defects arising during this warranty period shall be corrected without cost to the Owner.

The temperature control contractor's service office shall be within a 30 mile radius of the job site.

As part of the Service Agreement the contractor shall respond to the job site within an eight hour period for any emergency relating to the control system.

This service agreement shall include 24 hour emergency service.

There will be no charge to the owner for preventative maintenance of the control system during the warranty period.

1.7 SOFTWARE LICENSE AGREEMENT

The Owner shall sign a copy of the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.

Any licensing costs for the addition of this project to the existing Central Supervisory Server shall be a part of this contract.

1.8 SPECIFICATION COMPLIANCE REVIEW

All temperature control system/BAS contractor (including listed contractors) shall supply a paragraph by paragraph specification compliance report. The report shall indicate for each numbered paragraph, how the contractor meets the criteria of the paragraph. Each system is different the owner wants to know how different. The following format must be utilized in completing the compliance report:

Comply - without exception.

Qualify - Meet the functional intent. For each paragraph, the contractor shall identify all differences in specific functions stated in the given paragraph and provide a description of what is excluded or how the qualifying system will meet the function specified.

This control contractor shall have as an item on their proposal quotation to the mechanical contractor that includes the statement that they have submitted the COMPLIANCE REPORT on time.

1.9 AGENCY AND CODE APPROVALS

All Direct Digital Control panels of the BAS shall be provided with the following agency approvals. With the submittal documents, verification that the approvals exist for all submitted products shall be provided. Systems or products not currently offering the following approvals are not acceptable.

UL-916, Energy Management Systems
UL-873, Temperature Indication and Regulating Equipment
UUKL-864,
UL-864, Smoke Purge
CSA, Canadian Standards Association
FCC, Part 15, Subpart J, Class A Computing Devices

All products shall be labeled with the appropriate approval markings. System installation shall comply with NFPA, NEMA, Local and National codes.

1.10 FACTORY QUALITY CERTIFICATION

The Manufacturer of the Temperature Control System shall provide documentation supporting compliance with ISO-9002 (Model for Quality Assurance in Design/Development, Production, Installation and Servicing). The intent of this specification requirement is to assure that the products from the Temperature Control System Manufacturer are delivered through a Quality System and Framework that will assure consistent quality in the products delivered for this project.

Company literature provided by the Temperature Control System Manufacturer shall contain the ISO-9002 Certification Mark from the applicable registrar.

Temperature Control Manufacturers, that do not comply with the ISO-9002 certification requirement, shall provide the following information, to assure that quality systems are in place and equivalent to the ISO-9002 standard:

Marketing Specification Standards
Design File Standards
Manufacturing Test Standards
Calibration Standards
Quality System Standards
Quality System Procedures
Documented, Management Commitment that all employees participate in the Quality programs
Training Procedures
Methods by which corrective actions are taken for problems identified within the factory

Submittals not complying with technical requirements will be considered unacceptable.

1.11 TRAINING

The control sub-contractor shall provide the system operators complete instructions for proper control of the system under all modes of operation. These modes shall include, but not be limited to, summer/winter, occupied/unoccupied, and energy management, alarm event sequences, etc. The instructions shall be conducted during normal working hours, Monday through Friday at the respective building site and at the Energy Management Office as directed by Owner. These instructions shall consist of both classroom and hands-on training. Provide a minimum of 24 hours of training on the building system and graphics added to the system. An operator's manual shall provide detailed instructions for operating the installed system. Three (3) copies shall be supplied and utilized in operator's training curriculum.

Training shall address all operational functions available to the system at the building DCC panel and host system including but not limited to any system variable changes, programming changes, graphic creations or changes, report creations and changes, system functional changes, etc.-

Training shall include hardware repair and maintenance by Owner personnel of all building panels and building DCC control and monitoring devices, including but not limited to diagnostic procedures, system expansion and maintenance techniques.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

It is the intent to provide each building with a stand alone environmental and energy control system, which is responsive to the needs of its occupants, yet provides optimal energy use to the Owner. It is the further intent to provide this flexibility by providing, at a minimum, stand-alone control within each Heating Ventilating Air Conditioning (HVAC) equipment room. The County Wide Facility Management System shall communicate among the buildings and all the workstations. The Communications from the Server to the Backbone Network and from the Backbone Network to the respective buildings shall be by the way of a multi-access, information packet protocol, where each attached node has equal access to the data highway (network). The existing fully utilizes the Carrier Sensed Multiple Access with Collision Detection standard defined by IEEE 802.3. Bacnet is the preferred standard.

The intent of this specification is to provide a distributed DDC control system. Each unit operation, such as chiller and boiler plants, air handling units and air terminals shall be controlled by single application controllers; The application Controller shall be connected to the County Network. This connection permits the controller the ability to be accessed from any WorkStation on campus. Any WorkStation can access any point on their respective and selected campuses. All automatic control devices, including sensors, relays, transducers and related appurtenances, shall be provided and installed by the BAS contractor. Controlled devices such as valves, airflow dampers, and water temperature sensing wells shall be provided by the BAS contractor and installed by the mechanical contractor. The system shall accomplish the control sequences required by the sequence of operation specified. Control loops shall be

implemented using direct digital control (DDC) methods that provide proportional integral derivative (PID) control algorithms. PID control loops should be updated at least three times per second.

Each piece of HVAC equipment shall be controlled by a single DDC controller. All HVAC equipment should be supplied with the temperature controls manufactured by the successful "listed" supplier. If the HVAC equipment manufacturer submits in writing that the successful control contractor's equipment will not work on their HVAC equipment, then the controls must be compatible to existing communication networks. If the HVAC unit manufacturer can not furnish a compatible system as described herein then that manufacturer must supply an interface module to the successful listed control system. That interface must already exist and have documentation of its successful operation at least 180 calendar days before "Bid Day". It shall be the responsibility of the unit supplier to furnish and install all interconnectivity, checkout and commissioning of their system panels, as well as furnishing and installing a single point of connection to the existing LISTED DDC system. The connection must be within 50' of the existing system panel. All interface costs shall be that of the HVAC unit supplier.

The System has several Operator Workstations for the county interface to the Central Supervisory Server. The Server exists at the BB&T Building. The successful contractor shall add his software to the "host" (existing server) computer and the respective logic communication panels. This contractor shall de-bug the entire network system if the owner and / or Engineer determine that the addition of the new software has caused system degradation.

The controlled devices such as control valves and control air dampers shall be electronic.

2.2 COUNTY CENTRAL SUPERVISORY SERVER (CCSS) HARDWARE REQUIREMENTS

The Owner has an existing Central Station Workstation- upgrade or replace as required to allow smooth operation of ALL buildings.

2.3 BUILDING ENTERPRISE NETWORK CONTROLLER

2.3.1 GENERAL

The Building Network Controller (NC) shall be the electronic "Traffic Cop" for the information being shared among all the DDC stand-alone panels within the respective building. The Building NC is also the electronic link between the respective building and the county network.

The building NC shall be a networking stand-alone energy management panel enclosed in a sturdy metal enclosure. The GCM shall have peripheral ports for network communications.

The building NC shall be connected to the respective building field panel using Bacnet protocol. The NC shall also be connected to the respective County Network via Ethernet.

The software shall be capable of communication with the Workstation central processing unit (CPU) by use of the direct connects Bacnet. It will be possible to interrogate memory, change memory elements or manually override building equipment via any of the existing Workstations.

All programming defining the functions to be performed by the NC including but not limited to application programs and point database within each NC, shall be protected from loss due to power failure for a minimum of six months. Systems providing nonvolatile memory for these functions are preferred. Systems not providing nonvolatile memory shall provide Battery back-up sufficient to provide protection for the specified 6 month period. No system should be down for 6 months, but the battery shall be sized for this time period. When the battery deteriorates to age it will still protect the system for a reasonable period of time.

2.3.2 STAND ALONE BUILDING LOCAL CONTROL MODULE (MNL)

General

Standalone Local Control Module (MNL) shall be 16 bit microcomputer based, utilizing a multi-tasking, multi-user operating system.

2.3.3 INPUT/OUTPUT

Each point shall be discrete. No multiplexing to a single input or output shall be acceptable.

The Control Module input/output points include sensors, two-state commands, binary counters or analog outputs. The system shall have easily accessible terminal strips for connection of input/output wiring. All input/output wiring shall be of the Class II type. I/O voltages shall not exceed 24 volts AC or DC and current shall not exceed 1.0 ampere.

The Local Control Module shall contain functions as required to meet the capacity of the project.

The digital outputs shall be used for two state commands to loads, such as stop/start. The digital outputs shall provide a normally closed or open dry contact output with a minimum contact rating of 1 amp at 24 volts.

The digital inputs shall accept 2-state dry contacts for alarm or status monitoring or can count pulses from an energy demand generator.

Each Local Control Module can provide 1-11 volt DC analog outputs or 4-20 ma signals, not to exceed 80 ma output total. The analog signals must be software scaled to read-out in actual engineering units. Pulse width modulation will not be acceptable.

The analog inputs shall accommodate a wide range of industry standard sensors including resistive copper RTDs, 1 to 11 volts or 4 to 20 MA DC. Analog inputs will be scaled to read-out in engineering units, as appropriate.

2.4 UNITARY DIGITAL CONTROLLERS – Small stand alone controllers (UDC)

2.4.1 GENERAL

Control shall be by a minimum 16 bit microprocessor working from software program memory, which is physically located in the UDC.

All input/output signals shall be directly hardwired to the UDC. Trouble shooting of input/output signals shall be easily executed with a volt-ohm meter.

UDC shall be in continuous direct communication with the Network which forms the facility wide Automation System. The UDC shall perform all control as specified in the Sequence of Control.

All control sequences programmed into the UDC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery to be retained. Power failures shall therefore not cause the UDC memory to be lost, nor shall there be any need for batteries to be recharged or replaced. All control sequences shall be fully field programmable at the UDC controller to allow for the creation and change of a sequence.

2.5 FACILITY CONTROL FUNCTIONS:

The MNL's And the UDC's shall be integrated into the respective facility energy management and the campus enterprise control functions. The data such as: Facility Scheduling, Optimum start, Electric Demand Limiting, Trend reporting, and Maintenance Time Reminders are stored in the memory of the

respective MNL or UDC. All this data can be accessed from any connected display such as the County Central Console. Backup of the program database and all performance functions for the HVAC equipment in the respective facility shall be via the Central Supervisory Server.

DDC system shall control lighting based on a time clock schedule: the location and quantity of the lighting contactors provided by EC is shown on the Electrical Plans. The controls contractor shall extend wiring from the lighting contactors to the DDC panel.

2.6 OPERATOR ACCESS

Three security access levels shall be available for restrictive access of monitoring and/or editing stand alone programs or contents. Any operator shall have access to stand alone controller information as determined by individual operator access level. Access to stand alone controller information shall be available from the Central Console, any Network Controller, any plug in port at any network jack, or any WEB enabled hand held device.

2.7 MONITORING FUNCTIONS

From any operator access point, operators may monitor any of the information described under the sequence of operation and/or the point's list.

Monitor space temperature of Data Rooms conditioned by ductless split systems.

Monitor space temperature of storage rooms and garage subject to freezing temperatures.

PART 3 - SOFTWARE:

County Center Supervisory Server (CCSS)
Application Software
BAS Workstation (BAS-WS)
Graphics Generation

County Center Supervisory Server

The Owner owns an automation server (File Server) (County Center Supervisory Server).

Application Software

Application software is owned by the County. Provide a graphic package to be used on the technician's Workstations, central console and the technician's laptops

BAS Workstation

There are several computer consoles in use in various buildings throughout the County. These computers are all connected to the county WAN via Ethernet protocol. The county technicians have portable laptops and hand-held WEB-Enabled devices. This project shall be accessed by the WEB-Enabled devices via the CCS Server.

Graphic Generation

The owner has within the existing "HOST" software all tools needed to create and or change the existing graphic. The graphic tool allows the owner total capabilities. All software used to create the original graphic is a permanent part of the server software. The server has graphic software.

NOTE:

This contractor shall supply software that is 100% compatible with the existing. The addition of new control points and the respective software shall be a seamless integration

PART 4 - EXECUTION

Wiring practices: Plenum rated wire shall be acceptable for low voltage control and interlock wiring where in concealed, accessible locations and allowed by electrical code. In all other locations and where required by code EMT conduit will be used and division 26 guidelines will be enforced.

Final power connection: **Heating & Air Conditioning contractor shall furnish and install starters and disconnects. Electrical contractor will then wire to line side of each starter and disconnect. Electrical contractor shall wire from load side of each starter and disconnect to the respective motor terminals. All wire, conduit and junction boxes shall conform to electrical specifications. All work shall be performed by a licensed electrician.**

Zone sensors: It is imperative that the sensors located in the space be mounted with strict compliance with what is shown on the plans and mounting detail located on the plans. Any deviation of this must be approved by the engineer and documented as such. Thermostats and sensors with adjustable settings intended to be operable by the occupants shall be mounted to meet ADA regulations (at 48" AFF) while other control devices can be installed per owner preference (typically 54"AFF). Provide a minimum of five (5) sensors per floor with direct plug in capability for system interface.

Control 120V power: All 120V control power will be extended from a junction box located in the space supplied by and wired to the emergency power source circuit by the division 26 contractor. All control wiring shall connect to an emergency generator fed circuit. Control contractor shall extend 120 volt wiring as needed.

Out door air temperature and humidity: The outdoor air temperature and humidity will be field located on the north face of the building and the location is to be approved by the engineer.

Zone sensor Insulation: All zone sensors must be insulated from any air movement that may exist inside the walls.

PART 5 - SEQUENCE OF OPERATIONS

The contractor shall be required to program initial occupancy schedules and setpoints at each programmable devices, thermostats, and humidistats. Occupancy schedules and setbacks shall be coordinated with the owner.

AHU VAV Sequence of operation

Unit run command: The unit will be indexed to run when commanded to be occupied or if the night low limit is activated. Building occupancy will be determined by a schedule that is created by the county operational staff at the CCSS. The night low limit will be based on monitoring key zone temperatures and comparing the zone temperature to a night low limit set point. The occupancy schedule and night low limit set point must be adjustable from the CCSS.

With central system fan operating in unoccupied mode, sequence the controls as follows:

Field-adjustable temperature setback.
On heating demand, fan powered units' fans and heating coil are energized.
Volume damper is closed to minimum position.

A mixed air low temperature limit set at 40°F(adj) shall initiate a freeze protection sequence modulating the minimum OA damper, opening the chilled water coil control valve and starting the chilled water pumps.

A low temperature limit (Freezestat) thermostat shall be installed upstream chilled water coils or on the leaving side of the hot water coil on units that have outside air capabilities. The low temperature limit thermostat set at 36 degrees shall de-energize (Hardwired) the respective fan if the temperature sensed falls below the adjustable setpoint. The thermostat shall have two isolated electrical contacts. One contact shall de-energize the fans. The other contact shall signal the DDC system that alarm condition exists and the outside air damper shall be shut. The thermostat shall be automatic reset with a known differential temperature.

Supply fan and static pressure control: The supply duct static pressure shall be controlled by measuring the supply duct static pressure signals and comparing this values to the supply fan set point and adjusting the speed of the supply fans adjustable frequency drive accordingly. The supply static set points must be adjustable from the CCSS. The static pressure set point shall be reset based on the zone requiring the most pressure, i.e., the set point is reset lower until one zone damper is nearly wide open.

Supply air temperature reset: During occupied mode, the setpoint is reset from T-min (55°F) when the outdoor air temperature is 70°F and above, proportionally up to T-max
when the outdoor air temperature is 60°F and below.
T-max shall range from 55°F to 60°F. All temperature settings shall be adjustable.

Outside and return air damper: If the unit is not indexed to run then the OA will be closed and the return air damper will be 100% open. If the unit is indexed to run and free cooling is not available then the minimum OA damper shall be open and the return air damper actuator will modulate as explained below in the Return air dampers paragraph. If the unit is indexed to run and free cooling is available then the economizer OA damper / return air damper actuators will modulate to maintain mixed air setpoint. The mixed setpoint must be user adjustable from the CCSS.

Free Cooling: the unit-mounted controller will determine if free cooling is available by comparing return air enthalpy to OA enthalpy and determine. Free cooling will not be available if the outside air enthalpy is unfavorable or during unoccupied hours.

Minimum outdoor air control:
Open minimum outdoor air control damper when the supply air fan is proven on and the system is not in warm-up, cool-down, setup, or setback mode. Damper shall be closed otherwise.
The minimum differential pressure setpoint across the mixed air plenum (MinDP) is determined by the air balancer as required to maintain the design minimum outdoor airflow rate across the
minimum outdoor air damper with the supply air fan at design airflow. See below for return air damper control of mixed air plenum pressure.
Readings of the minimum outside air flow shall be provided to DDC by an airflow measuring station.

Return air dampers:
When the economizer is not enabled, the return air dampers signal is modulated to maintain differential pressure across the minimum outdoor air damper at setpoint (MinDPsp) determined above.
When the economizer is in control, the return air dampers are sequenced with the outdoor air economizer dampers.

Return fans sequence:
Return fans operate whenever supply fans are proven on.
Return fans speed shall be controlled to maintain return fans discharge static pressure at setpoint. The setpoint shall be determined in conjunction with the air balancer as the larger of the following:

1) That required to deliver the design return air volume across the return air damper when the supply air fan is at design airflow and on minimum outdoor air.

2) That required to exhaust enough air to maintain space pressure at setpoint (0.05") when the supply air fan is at design airflow and on 100% outdoor air.

Relief air dampers:
Relief dampers shall only be enabled when the associated supply and return fan are proven on and the minimum outdoor air damper is open. The relief dampers shall be closed when disabled.
Building static pressure shall be time averaged with a sliding five-minute window (to reduce damper and fan control fluctuations). The averaged value shall be that displayed and used for control of the relief damper.
When the relief dampers are enabled, they shall be controlled by a PI loop that maintains the building pressure at a setpoint of 0.05". (Due the potential for interaction between the building pressurization and return fan control loops, extra care must be taken in selecting the PI gains.
It is recommended that the closed loop response time of the building pressurization loop should not exceed one-fifth the closed loop response time of the return fan control loop to prevent excessive control loop interaction. This can be accomplished by decreasing the gain of the building pressurization controller.) If air flow monitoring stations are shown, calculate and control the damper(s)/fan(s) to achieve a 15% (adj) positive building pressure.

All air temperature and smoke safeties shall override this sequence at a higher command level.

Cooling valve operation: If the chilled water system is not indexed to operate all chilled water valves shall be indexed to close. If during cooling season the unit is not indexed to run then the cooling valve will be closed. The cooling command will be based on a "high signal" selection between the deviation of the supply air temperature verses setpoint and the return air humidity verses setpoint. As the high signal begins to increase the units cooling valve will begin to modulate open. If the high signal continues to rise then the cooling valve will continue to move towards the full open position. As the high signal begins to decrease then the cooling valve will be modulated towards the full closed position. The supply air setpoint and the return air humidity setpoint must be user adjustable from the CCSS.
The chilled water valve shall be set open when the mixed air low limit of roof mounted AHU shall initiate the freeze protection sequence.

Fan powered parallel VAV boxes with hot water reheat

Supply air damper: The supply air damper will be commanded shut to its minimum setting when the area is not occupied. When the area is occupied then the supply air damper will be modulated to maintain supply air CFM as sensed by the VAV controller. The supply CFM setpoint will be reset based on a comparison of the wall mounted zone temperature sensor and the zone temperature setpoint. As the zone air temperature rises the supply CFM setpoint will continue to be reset until the box is at its maximum allowable CFM setpoint. On a fall in zones temperature below the cooling setpoint the VAV damper shall modulate toward its minimun closed position. As the zone temperature continues to fall the supply CFM will be reset down until it reaches its minimum allowed CFM setpoint. If the zone temperature continues to fall below the zone temperature heating setpoint then the parallel fan will be indexed to run and the hot water valve will be indexed to open. On a rise in zone temperature the sequence shall occur in reverse.

Fan powered series VAV boxes with hot water reheat

The series fan with ECM motors shall be energized and **run continuous before the AHU supply fan is energized**. Supply air damper: The supply air damper will be commanded shut to its minimum setting when the area is not occupied. When the area is occupied then the supply air damper will be modulated to maintain supply air CFM as sensed by the VAV controller. The supply CFM setpoint will be reset

based on a comparison of the wall mounted zone temperature sensor and the zone temperature setpoint. As the zone air temperature rises the supply CFM setpoint will continue to be reset until the box is at its maximum allowable CFM setpoint.
On a fall in zones temperature below the cooling setpoint the VAV damper shall modulate toward its minimum closed position and the hot water valve will be indexed to open.

Cooling only VAV boxes

Supply air damper: The supply air damper will be commanded shut when the area served by the terminal unit is not occupied. When the area is occupied then the supply air damper will be modulated to maintain supply air CFM as sensed by the VAV controller. The supply CFM setpoint will be reset based on a comparison of the wall mounted zone temperature sensor and the zone temperature setpoint. As the zone air temperature rises the supply CFM setpoint will continue to be reset until the box is at its maximum allowable CFM setpoint. The zone air setpoint must be user adjustable from the CCSS.

VAV boxes with hot water reheat

Supply air damper: The supply air damper will be commanded shut when the area is not occupied. When the area is occupied then the supply air damper will be modulated to maintain supply air CFM as sensed by the VAV controller. The supply CFM setpoint will be reset based on a comparison of the wall mounted zone temperature sensor and the zone temperature setpoint. On a fall in zone temperature below the cooling setpoint the VAV damper shall modulate toward the closed or minimun position. On a further fall in zone temperature the hot water booster valve shall be indexed to open toward its fully open position. On a rise in zone temperature the sequence shall occur in reverse.

Vav boxes room occupancy

The rooms' occupancy shall be sensed from a dry contact of the lights occupancy sensor (occupancy sensors are not in contract). In summer condition the min of the Vav boxes shall be set to zero if the corresponding room is unoccupied unless the room temperature is not met. Once the room is occupied the Vav box shall resume the occupied sequence.

4 pipes heating and cooling Units

If there is no occupants during occupied operation cycle the outside air damper shall close. On detection of an occupant the outside air damper shall be indexed to the open to a preset (balanced) position.
If the zone temperature drops below zone temperature setpoint then the heating control valve will begin to modulate open. As the zone temperature begins to rise the hot water valve will modulate toward the closed position. When the zone temperature reaches the zone temperature setpoint then the hot water valve will be shut.
On a rise in space temperature above the cooling setpoint the cooling valve shall modulate to maintain space conditions. Fans shall be indexed to run continuously during occupied cycles.

Heating and ventilating units

If the zone temperature drops below zone temperature setpoint then the heating control valve will begin to modulate open. As the zone temperature begins to rise the hot water valve will modulate toward the closed position. When the zone temperature reaches the zone temperature setpoint then the hot water valve will be shut.
Morning warm-up: The heating and ventilating units shall monitor the return air temperature and not permit the outside air damper to open during morning warm-up until the return air temperature is above 68 degrees or the building is occupied.

Hot water unit heaters

If the zone temperature drops below zone temperature setpoint
(60 deg adj.) then the fan will be energized and the heating control valve will begin to modulate open. As the zone temperature begins to rise the hot water valve will modulate toward the closed position. When the zone temperature reaches the zone temperature setpoint then the hot water valve will be shut and the fan de-energized.

Exhaust fans

Toilet exhaust fans: The rest room exhaust fans shall be started and stopped by CCSS time schedule. All exhaust fans including the one with manual switch shall be started and stopped by CCSS time schedule (the goal is to avoid leaving exhaust fans on when the building is unoccupied).

Chilled water system

Mechanical cooling needed: The need of mechanical cooling is based on an outdoor air temperature setpoint and if the building is in the occupied cycle selected by the CCSS command or the CCSS schedule; replace existing time clock with remote time clock function. Once the OA temperature exceeds the setpoint the chiller pumps and chillers is enabled. The OA temperature setpoint must be user adjustable from the CCSS; provide remote setpoint. The chilled water pumps are indexed into operation via the CCSS unless the chiller manufacture requires that they control the pumps.
Maintain the following sequence: The chilled water pumps will be indexed on when one of the VAV systems is running and the outside air temperature is greater than 55°F (adj).
The chilled water pumps shall be indexed to run when the mixed air low limit of AHU shall initiate the freeze protection sequence.

Chillers: Chillers are not allowed to operate when the outside air temperature is below 55°F (adj.) or when all VAV AHUs are off.
The chillers are commanded on when mechanical cooling is needed. The chilled water and condenser pumps for the chillers are indexed to run. After the chilled water and condenser pump for the lead chiller are running then the lead chiller is enabled to run. Stage chillers to achieve maximum efficiency first and balance hours as a secondary function.

For buildings with two or more chillers, chillers shall be staged on and off to maximize energy efficiency. Upon building call for cooling, turn on secondary chilled water pump. Initially open one motorized valve to allow water flow to chiller #1. After time delay, initiate chilled water pump #1 (or if chiller mfg. requires control- coordinate). After flow is established, enable chiller #1. If chilled water return temperature continues to rise after time delay, initiate motorized valve to allow water flow to chiller #2. Similarly start primary chilled water pump #2 and after delay, enable chiller #2. Reverse operation to turn off second chiller as load decreases. Alternate lead/lag and upon failure, swap.

Hot water system

The condensing boilers should be staged to achieve maximum efficiency- i.e. operate 2 boilers at 55% load instead of one at 100%. Verify with successful boiler mfg. as to the optimum operation points. Provide signal to each boiler to set desired temperature and to enable boiler.

Heating needed: When two (adjustable) or more zones request heating, initiate system. Also if dehumidification cycle is needed initiate boilers. Boiler supply temperatures shall range from 90F(adj) output at 70F or higher outdoor temperature to 140F(adj) at 35F or lower.
Hot water pumps: The hot water pumps are indexed on when there is a need for heating and remains on until commanded off when there is no longer a need for heating.

The hot water pumps shall be indexed to run when the building is in unoccupied mode and the space temperature is below 55 degrees (adjustable).

OAU:
The OAU units shall be started and stopped from a time schedule that is programmed in the DDC system. Discharge air temperature sensors (after the heating section) and a discharge air humidity sensor shall be provided and installed. Note: The control contractor shall coordinate with the OAU manufacturer to have a DDC controller with Bacnet communication in the OAU unit. The OAU is independent from the chiller/boiler system as it is self-contained with natural gas heat, electric heat, and dx cooling. When the unit is scheduled to be on, the unit is enabled. The discharge air sensor and humidity sensor will monitor the temperature and humidity leaving the OAU. The controls shall modulate the Face & Bypass Damper to achieve discharge air temperature of 70° (adj.). The DDC system shall enable and disable the operation of the OAU and the factory mounted controls on the OAU shall control all internal functions relating to the staging of the gas heat, electric heat, dx cooling stages, hot gas reheat, alarms, etc. to maintain temperature and humidity setpoints. An outside air damper shall be provided on the O.A. unit that will open during the Occupied cycle and will remain closed during the Unoccupied cycles. All unit alarms shall be sent to a common alarm that shall be monitored by the DDC system. Also a remote status panel shall be installed in the Office Area.

Miscellaneous

Monitor Duke Energy electric utility meter. Contractor shall contact Duke to install pulse meter; provide KW and KWH data and graphs.

Fire alarm shutdown: The CCSS will monitor the fire alarm via a local mounted fire alarm relay provided, wired and mounted by the division 26 contractor.

Stager start / restart: The CCSS will institute a staggered starting schedule anytime all HVAC equipment is commanded on such as by time schedule, power fail restart, emergency stop or fire alarm command.

END OF SECTION 23 09 00

SECTION 23 09 23 –AIRFLOW INSTRUMENTS

PART 1 -GENERAL

1.1 SECTION INCLUDES
- A. Related Sections
- B. References
- C. Submittals
- D. Qualifications
- E. System Responsibility
- F. Warranty
- G. Delivery, Storage, and Handling

1.2 REFERENCES
- A. UL 873 – Temperature and Airflow Indicating Equipment

1.3 SUBMITTALS
- A. Submit product data sheets for airflow measuring devices indicating minimum placement requirements, sensor density, sensor distribution, and installed accuracy to the host control system.
  - 1. Devices whose accuracy is the combined accuracy of the transmitter and sensor probes must demonstrate that the total accuracy meets the performance requirements of this specification throughout the measurement range.
- B. Submit a schedule of airflow measuring devices indicating compliance with specified accuracy at minimum and maximum airflow rates.
- C. Submit installation, operation and maintenance documentation.

1.4 QUALIFICATIONS
A. Manufacturer: The company manufacturing the products specified in this section shall have a minimum of ten years experience producing products of this type.

1.5 SYSTEM RESPONSIBILITY
A. The contractor shall be responsible for any and all costs associated with any and all changes resulting from the use of a supplier other than the basis of design.

1.6 WARRANTY
A. Provide a manufacturer's parts warranty for 36 months from the date of unit shipment or 24 months from date of acceptance- whichever is greater.

1.7 DELIVERY, STORAGE, AND HANDLING
A. All handling and storage procedures shall be per manufacturer's recommendations.
B. Airflow measuring devices shall be kept clean and dry, protected from weather and construction traffic.

PART 2 PRODUCTS
2.1 ACCEPTABLE MANUFACTURERS
A. EBTRON, Inc. Model GTx116-P and GTx116-F (basis of design)
- 1. Alternatives requesting acceptance as "equals" less than 14 days prior to bid date or products submitted in non-conformance with the requirements of this specification will not be considered.
- 2. For any product to be considered for substitution a written section-by-section detailed exceptions/compliance document shall be submitted to the Engineer before any approval will be considered.

B. Kurz Instruments
- 1. Multi point sensing required
- 2. Follow sensor density requirements as listed.

C. Fluid Components, Inc.
1. Multi point sensing required
2. Follow sensor density requirements as listed.

D. Air Monitor Corporation Electra-Flo
1. Multi point sensing required
2. Follow sensor density requirements as listed.

2.2 AIRFLOW/TEMPERATURE MEASUREMENT DEVICES
A. Provide airflow/temperature measurement devices where indicated on the plans. Fan inlet measurement devices shall not be substituted for duct or plenum measurement devices indicated on the plans. NOTE: Device mfg rep. shall review drawings and field conditions and approve installation locations.

B. Each measurement device shall consist of one or more sensor probe assemblies and a single microprocessor-based transmitter. Each sensor probe assembly will contain one or more independently wired sensor housings. Multiple sensor housings shall be equally weighted and averaged by the transmitter prior to output. Pitot tubes and arrays are not acceptable. Vortex shedding flow meters are not acceptable.

C. All Sensor Probe Assemblies
1. Each sensor housing shall be manufactured of a U.L. listed engineered thermoplastic.
2. Each sensor housing shall utilize two hermetically sealed, bead-in-glass thermistor probes to determine airflow rate and ambient temperature. Devices that use "chip" type thermistors are unacceptable. Devices that do not have 2 thermistors in each sensor housing are not acceptable.
3. Each sensor housing shall be calibrated at a minimum of 16 airflow rates and have an accuracy of +/-2% of reading over the entire operating airflow range. Each sensor assembly shall be calibrated to standards that are traceable to the National Institute of Standards and Technology (NIST).
a.). Devices whose accuracy is the combined accuracy of the transmitter and sensor probes must demonstrate that the total accuracy meets the performance requirements of this specification throughout the measurement range.
4. The operating temperature range for the sensor probe assembly shall be -20° F to 160° F. The operating humidity range for the sensor probe assembly shall be 0-99% RH (non-condensing).
5. Each temperature sensor shall be calibrated at a minimum of 3 temperatures and have an accuracy of +/-0.15° F over the entire operating temperature range. Each temperature sensor shall be calibrated to standards that are traceable to the National Institute of Standards and Technology (NIST).
6. Each sensor probe assembly shall have an integral, U.L. listed, plenum rated cable and terminal plug for connection to a remotely mounted transmitter. All terminal plug interconnecting pins shall be gold plated.
7. Each sensor assembly shall not require matching to the transmitter in the field.
8. A single manufacturer shall provide both the airflow/temperature measuring probe(s) and transmitter at a given measurement location.

D. Duct and Plenum Sensor Probe Assemblies
1. Sensor housings shall be mounted in an extruded, gold anodized, 6063 aluminum tube probe assembly.
2. The number of sensor housings provided for each location shall be as follows:
a). Area (sq.ft.) Sensors
<=1 2
>1 to <4 4
4 to <8 6

8 to <12 8
12 to <16 12
>=12 16

3. Probe assembly mounting brackets shall be constructed of 304 stainless steel. Probe assemblies shall be mounted using one of the following options:
   a.) Insertion mounted through the side or top of the duct
   b.) Internally mounted inside the duct or plenum
   c.) Standoff mounted inside the plenum
4. The operating airflow range shall be 0 to 5,000 FPM unless otherwise indicated on the plans.

E. Fan Inlet Sensor Probe Assemblies
1. In applications where flow stations with multiple probes and sensors are not feasible based on AHU design, Fan Inlet Sensors will be applied as follows.
2. Sensor housings shall be mounted on 304 stainless steel blocks.
3. Mounting rods shall be field adjustable to fit the fan inlet and constructed of nickel plated steel.
4. Mounting feet shall be constructed of 304 stainless steel.
5. The operating airflow range shall be 0 to 10,000 FPM unless otherwise indicated on the plans.

F. Transmitters
1. The transmitter shall have an LCD display capable of displaying airflow and temperature. Airflow shall be field configurable to be displayed as a velocity or a volumetric rate.
2. The transmitter shall be capable of displaying the individual airflow and temperature readings of each sensor on the LCD display.
3. The transmitter shall operate on 24 VAC. The transmitter shall not require an isolated power source.
4. The operating temperature range for the transmitter shall be -20° F to 120° F. The transmitter shall be protected from weather and water.
5. Provide transmitter with direct integration to DDC system. Utilize temperature output from device for monitoring and controlling as specified.
6. The transmitter shall also be capable, using interchangeable communication boards, of communicating with the host controls using one of the following interface options:
   a. Linear analog output signal: Field selectable, fuse protected and isolated, 0-10VDC and 4-20mA (4-wire)
   b. RS-485: Field selectable BACnet-MS/TP, ModBus-RTU and Johnson Controls N2 Bus
   c. 10 Base-T Ethernet: Field selectable BACnet Ethernet, BACnet-IP, ModBus-TCP and TCP/IP
   d. LonWorks Free Topology

G. The measuring device shall be UL listed as an entire assembly.
H. The manufacturer's authorized representative shall review and approve placement and operating airflow rates for each measurement location indicated on the plans. A written report shall be submitted to the consulting mechanical engineer if any measurement locations do not meet the manufacturer's placement requirements.

PART 3 EXECUTION

3.1 INSTALLATION
A. Install in accordance with manufacturer's instructions at the locations indicated on the plans. A written report shall be submitted to the consulting mechanical engineer if any discrepancies are found.

3.2 ADJUSTING

A. Duct and plenum devices shall not be adjusted without approval from the consulting mechanical engineer.

PART 4 SEQUENCE OF OPERATIONS

4.1 UTILIZATION OF AIRFLOW MEASURING DEVICE TO MAINTAIN BUILDING PRESSURIZATION AND/OR AHU CONTROL

A. Utilize feedback from airflow measuring device to maintain ventilation rates as listed.
B. Modulate control dampers and/or variable frequency drives to insure ventilation rates as Indicated
4.2 TESTING & DEMONSTRATION
Provide TAB demonstration to the Commissioning Agent. Verify overall building pressurization and document. Provide differential pressure readings at each exterior door after building has been under "normal" operation without doors and windows being open for building construction or furniture/equipment installation.

END OF SECTION 23 09 23

SECTION 23 20 00 - MECHANICAL HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to this section.

1.2 SUMMARY

A. This Section includes piping systems for hot water heating, chilled water cooling, make-up water, and condensate drain piping. Piping materials and equipment specified in this Section include:

B. Pipes, fittings, and specialties;
C. Special duty valves; hydronic specialties.

1.3 SYSTEM DESCRIPTION

A. General: The hydronic piping systems are the "water-side" of an air-and-water or all-water heating and air conditioning system. Hydronic piping systems specified in this Section include 4-pipe, hot water and chilled water piping system. These systems are classified by ASHRAE as Low Water Temperature, Forced, Recirculating systems.

B. 4-Pipe System: The 4-pipe system includes independent chilled water and hot water supply and return piping mains in a closed loop, connecting the boilers and chiller to the terminal heat transfer units by means of primary piping loops. Circulation is accomplished by parallel, constant volume, primary pumps. Design flow rates and water temperatures are specified in the various equipment specifications and schedules. Control sequences and temperature reset schedules are specified in the temperature control specifications.

1.4 SUBMITTALS

Product Data, including rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties and accessories, and installation instructions for each hydronic specialty and special duty valve specified.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the provisions of the following:
B. ASME B 31.9 "Building Services Piping" for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label.

C. Fabricate and stamp air separators and compression tanks to comply with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide hydronic piping system products from one of the following:

1. Pump Discharge Valves:
    a. Armstrong Pumps, Inc.

b. Bell & Gossett ITT; Fluid Handling Div.
c. Taco, Inc.

2. Safety Relief Valves:
   a. Bell & Gossett ITT; Fluid Handling Div.
   b. Spirax Sarco.
   c. Watts Regulator Co.

3. Pressure Reducing Valves:
   a. Armstrong Pumps, Inc.
   b. Bell & Gossett ITT; Fluid Handling Div.
   c. Taco, Inc.

4. Flow Control Valves:
   a. Autoflow
   b. Flow Design, Inc.
   c. Griswold

5. Air Vents (manual and automatic):
   a. Armstrong Machine Works.
   b. Bell & Gossett ITT; Fluid Handling Div.
   c. Hoffman Specialty ITT; Fluid Handling Div.
   d. Spirax Sarco.

6. Diaphragm-Type Compression Tanks:
   a. Armstrong Pumps, Inc.
   b. Bell & Gossett ITT; Fluid Handling Div.
   c. Taco, Inc.

7. Dielectric Unions:
   a. Perfection Corp.
   b. Watts Regulator Co., or equal.

8. Y-Pattern Strainers:
   a. Armstrong Machine Works.
   b. Hoffman Specialty ITT; Fluid Handling Div.
   c. Spirax Sarco.
   d. Trane Co.
   e. Watts Regulator Co.

2.2 PIPE AND TUBING MATERIALS

General: Refer to Part 3 Article "PIPE APPLICATIONS" for identification of where the below materials are used.

- Drawn Temper Copper Tubing: ASTM B 88, Type L.
- Steel Pipe: ASTM A 53, Schedule 40, Grade B, seamless or ERW, black steel pipe, plane ends.

2.3 FITTINGS

A. Malleable-Iron Threaded Fittings: ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B1.20.1.

B. Steel Fittings: ASTM A 234, seamless or welded, for welded joints.

C. Wrought-Copper Fittings: ANSI B16.22, streamlined pattern.

D. Steel Flanges and Flanged Fittings: ANSI B16.5, including bolts, nuts, and gaskets of the following material group, end connection and facing:

- Material Group: 1.1.
- End Connections: Butt Welding.
- Facings: Raised face.

E. Unions: ANSI B16.39 malleable-iron, Class 150, hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends. Threads shall conform to ANSI B1.20.1.

F. Dielectric Unions: Threaded or soldered end connections for the pipe materials in which installed; constructed to isolate dissimilar metals, prevent galvanic action, and prevent corrosion.

2.4 JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, 95-5 Tin-Antimony.

B. Brazing Filler Metals: AWS A5.8, Classification BAg 1 (Silver).

C. Welding Materials: Comply, with Section II, Part C. ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.

D. Gasket Material: Thickness, material, and type suitable for fluid to be handled, and design temperatures and pressures.

2.5 GENERAL DUTY VALVES

General duty valves (i.e., , globe, check, ball, and butterfly valves) are specified in Division 23 Section "General Duty Valves." Special duty valves are specified below by their generic name.

2.6 SPECIAL DUTY VALVES

A. Pump Discharge Valves: B&G Model No. 3D, 175 psig working pressure, 300 deg F maximum operating temperature, cast-iron body, bronze disc and seat, stainless steel stem and spring, and "Teflon" packing. Valves shall have flanged connections and straight or angle pattern as indicated. Features shall include non-slam check valve with spring-loaded weighted disc, and calibrated adjustment feature to permit regulation of pump discharge flow and shutoff. NOTE: Pumps being controlled by VFD's shall have flow adjusted by the drive and not adjusting the discharge valve.

B. Pressure Reducing Valves: B&G Model No. B7, diaphragm operated, brass body valve, with low inlet pressure check valve, inlet strainer removable without system shut-down, and noncorrosive valve seat and stem. Select valve size, capacity, and operating pressure to suit system. Valve shall be factory-set at operating pressure and have the capability for field adjustment.

C. Safety Relief Valves: 125 psig working pressure and 250 deg F maximum operating temperature; designed, manufactured, tested, and labeled in accordance with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code. Valve body shall be cast-iron, with all wetted internal working parts made of brass and rubber. Select valve to suit actual system pressure and Btu capacity.

D. Combined Pressure/Temperature Relief Valves: diaphragm operated, cast-iron or brass body valve, with low inlet pressure check valve, inlet strainer removable without system shut-down, and noncorrosive valve seat and stem. Select valve size, capacity, and operating pressure to suit

system. Valve shall be factory-set at operating pressure and have the capability for field adjustment. Safety relief valve designed, manufactured, tested, and labeled in accordance with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code. Valve body shall be cast-iron, with all wetted internal working parts made of brass and rubber; 125 psig working pressure and 250 deg F maximum operating temperature. Select valve to suit actual system pressure and Btu capacity. Provide with fast fill feature for filling hydronic system.

2.7 HYDRONIC SPECIALTIES

A. Manual Air Vent: Bronze body and nonferrous internal parts; 150 psig working pressure, 225 deg F operating temperature; manually operated with screwdriver or thumbscrew; and having 1/8 inch discharge connection and 1/2 inch inlet connection.

B. Air Control Tank Fitting: Cast-iron body, copper-plated tube, brass vent tube plug, and stainless steel ball check; sized for compression tank diameter. Design tank fittings for 125 psig working pressure and 250 deg.F maximum operating temperature.

C. Tank Drain Fitting: Brass body nonferrous internal parts; l25 psig working pressure and 240 deg. F maximum operating temperature. Fitting shall be designed to admit air to the compression tank and drain water close off the system.

D. Bladder-Type Expansion Tanks: B & G Model B-"x". Manufacturer shall verify acceptance volume and sizing of tanks- increase size as required- do not decrease. Refer to plans for minimum size. Construct of welded carbon steel for 125 psig working pressure, 375 deg F maximum operating temperature. Separate air charge from system water to maintain design expansion capacity, by means of a flexible bladder securely sealed into tank. Provide taps for pressure gage and air charging fitting, and drain fitting. Support vertical tanks with steel legs or base; support horizontal tanks with steel saddles. Tank, with taps and supports, shall be constructed, tested, and labeled in accordance with ASME Pressure Vessel Code, Section VIII, Division 1.

E. Flow Control Valves: Valves shall have brass body, nickel plated piston/regulator, stainless steel spring and retainer ring. Provide molded insulation for each. Submit schedule for approval. See 15135-2.

F. Y-Pattern Strainers: 125 psig working pressure cast-iron body (ASTM A 126, Class B), flanged ends for 2-1/2 inch and larger, threaded connections for 2 inch and smaller, bolted cover, perforated Type 304 stainless steel basket, and bottom drain connection.

PART 3 - EXECUTION

3.1 PIPE APPLICATIONS

A. Install Type L, drawn copper tubing with wrought copper fittings and solder joints for 2 inches and smaller, above ground, within building. Install Type K, annealed temper copper tubing for 2 inch and smaller without joints, below ground or within slabs.

B. Install steel pipe with threaded joints and fittings for 2 inch and smaller, and with welded joints for 2-1/2 inch and larger.

3.2 PIPING INSTALLATIONS

A. Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. Locations and arrangements of piping take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.

B. Use fittings for all changes in direction and all branch connections.

3.3 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in the system, at heat transfer coils, and elsewhere as required for system air venting.

B. Install pump discharge valves in horizontal or vertical position with stem in upward position. Allow clearance above stem for check mechanism removal.

C. Install diaphragm-type compression tanks on floor as indicated. Vent and purge air from hydronic system, charge tank with proper air charge to suit system design requirements.

3.4 FIELD QUALITY CONTROL

A. Preparation for testing: Prepare hydronic piping in accordance with ASME B 31.9 and as follows:

B. Leave joints including welds uninsulated and exposed for examination during the test.

C. Provide temporary restraints for expansion joints which cannot sustain the reactions due to test pressure. If temporary restraints are not practical, isolate expansion joints from testing.

D. Flush system with clean water. Clean strainers.

E. Isolate equipment that is not to be subjected to the test pressure from the piping. If a valve is used to isolate the equipment, its closure shall be capable of sealing against the test pressure without damage to the valve. Flanged joints at which blinds are inserted to isolate equipment need not be tested.

F. Install relief valve set at a pressure no more than 1/3 higher than the test pressure, to protect against damage by expansion of liquid or other source of overpressure during the test.

G. Subject piping system to a hydrostatic test pressure which at every point in the system is not less than 1.5 times the design pressure. The test pressure shall not exceed the maximum pressure for any vessel, pump, valve, or other component in the system under test. Make a check to verify that the stress due to pressure at the bottom of vertical runs does not exceed either 90 percent of specified minimum yield strength, or 1.7 times the "SE" value in Appendix A of ASME B31.9, Code For Pressure Piping, Building Services Piping.

3.5 ADJUSTING AND CLEANING

Clean and flush hydronic piping systems. Remove, clean, and replace strainer screens. After cleaning and flushing hydronic piping system, but before balancing, remove disposable fine mesh strainers in pump suction diffusers.
Mark calibrated nameplates of pump discharge valves after hydronic system balancing has been completed, to permanently indicate final balanced position.

END OF SECTION 23 20 00

SECTION 23 21 23 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

This Section includes the following types of HVAC pumps:

Vertical inline close-coupled pumps.

Refer to schedule on drawing for pump models and capacities.

1.3 SUBMITTALS

Product data including certified performance curves of selected models indicating selected pump's operating point, weights (shipping, installed, and operating), furnished specialties, and accessories.

1.4 QUALITY ASSURANCE

A. Hydraulic Institute Compliance: Design, manufacture, and install HVAC pumps in accordance with "Hydraulic Institute Standards."

B. National Electrical Code Compliance: Provide components complying with NFPA 70 "National Electrical Code."

C. UL Compliance: Provide HVAC pumps which are listed and labeled by UL, and comply with UL Standard 778 "Motor Operated Water Pumps."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the following or approved equal:

1. Close Coupled Inline Pumps:

a) Armstrong Pumps, Inc.
b) Bell & Gossett ITT.
c) Taco, Inc.
d) Patterson Pumps

2.2 PUMPS, GENERAL

A. Pumps and Circulators: Factory-assembled and factory-tested. Fabricate casings to allow removal and replacement of impellers without necessity of disconnecting piping. Type, sizes, and capacities shall be as indicated.

B. Motors: Conform to NEMA Standards inverter duty rated, premium efficiency, Design B, except Design C where required for high starting torque; single, multiple, or variable speed with type of enclosure and electrical characteristics as indicated; have built-in thermal- overload protection, and

grease-lubricated ball bearings. Select motors that are non-overloading within the full range of the pump performance curve and compatible with drives.

2.3 INLINE PUMPS

PUMPS

B. Vertical Close Coupled Pumps.

1. The pumps shall be single stage end suction rear pull out design. The seal shall be serviceable without disturbing the piping connections. The capacities and characteristics shall be as called for in the plans/schedules.
2. Pump casing shall be constructed of ASTM A48 class 30 cast iron. The pump casing/volute shall be rated for 250 psi working pressure for all jobs. The pump flanges shall be matched to suit the working pressure of the piping components on the job, with either ANSI Class 125 flanges or ANSI class 250 flanges. The pump casing shall be drilled and tapped for gauge ports on both the suction and discharge connections and for a drain port at the bottom of the casing. The casing shall have an additional tapping on the discharge connection to allow for the installation of a seal flush line. The pump cover shall be drilled and tapped to accommodate a seal flush line which can be connected to the corresponding tapping on the discharge connection, or to an external source to facilitate cooling and flushing of the seal faces.
3. All casings shall be flanged. Threaded casings not allowed unless extra unions and fittings are provided with that pump to allow servicing.
4. The pump shall have a factory installed vent/flush line to insure removal of trapped air from the casing and mechanical seal cooling. The vent/flush line shall run from the seal chamber to the pump discharge.
5. The impeller shall be ASTM B584-836/875 bronze and hydraulically balanced. The impeller shall be dynamically balanced to ANSI Grade G6.3 and shall be fitted to the shaft with a key. The impeller shall be cast by the hydraulically efficient lost foam technique to ensure repeatability of high quality.
6. The pump shall incorporate a dry shaft design to prevent the circulating fluid from contacting the shaft. The pump shaft shall be AISI 1045 carbon steel with field replaceable bronze SAE 660 shaft sleeve. In order to improve serviceability and reduce the cost of ownership the shaft sleeve must be slip on (press on not allowable) and must be easily replaced in the field.
7. The pump shall be fitted with a single mechanical seal, with EPT elastomers and Carbon/Ceramic faces, rated up to 250°F. This seal must be capable of being flushed externally via a tapping in the pump cover adjacent to the seal cavity. The entire pump line shall use no more than three different sizes of seals.
8. The pump shall be close coupled to a NEMA standard JM frame motor.
9. In order to both simplify and reduce the total cost of ownership, the manufacturer shall standardize on no more than three sizes of mechanical seals through out the entire range of the family of pumps. The manufacturer shall not use multiple part numbers for the same part.

10. All pumps shall be fitted with a discharge multi-purpose balancing valve or other means of providing system balance, isolation, and check feature for reverse flow. The valve shall be straight or angle pattern and shall be field convertible between the two. The valve shall be ductile iron and rated for 250 psi working pressure for all jobs. The valve flanges shall be matched to suit the working pressure of the piping components on the job; with either ANSI class125 psi flanges or ANSI class 250 flanges. The valve shall include the following components; non-slam check valve with spring-loaded bronze disc and seat,

stainless steel stem, and calibrated adjustment permitting flow regulation. Valve shall be serviceable under full system pressure. The valve shall be a Taco model MPV Plus Two multi-purpose valve or equivalent.

11. All pump suctions to be fitted with a multifunction inlet suction diffuser fitting equal to that as manufactured by Taco, Inc. The suction guide body and cover plate shall be ductile iron and be rated for 250 psi for all jobs. The guide flanges shall be matched to suit the working pressure of the piping components on the job; with either ANSI class 125 flanges or ANSI class 250 flanges. The suction guide shall include the following components; full length S.S. straightening vanes, permanent S.S. strainer, disposable 16 mesh bronze start up strainer, blow down ports, and metering ports. For those pumps where an inlet guide fitting is not installed, there should be five pipe diameters of straight undisturbed flow going into the pump suction. The fitting shall be a Taco model SD inlet suction elbow or equivalent.
12. All pumps shall be fitted with one 4 ½" dial pressure gauge piped to the inlet and outlet pump flanges. The gauge is to be isolated from each flange via ¼" ball valve. This gauge is to be used to take the differential across the pump unless otherwise indicated.
13. Contractor shall install pump in accordance with the manufacturer's instructions. Contractor shall level each pump.
14. Pipe connections to pumps shall be made in such a manner so as not to exert any stress on pump housings. If necessary to meet this requirement, provide additional pipe supports and flex connectors.
15. Pumps shall **NOT** be run dry to check rotation.
16. Change start-up strainers to permanent strainer upon acceptance of the job. Provide a blowdown valve on each strainer and terminate with hose thread or extend blowdown line to nearest floor drain.

2.4 EQUIPMENT BASES

Support pumps per manufacturer's recommendations. All inline pumps shall be mounted close to the floor for service and maintenance. Refer to drawings and details.

2.5 INSTALLATION

A. General: Comply with the manufacturer's written installation and alignment instructions.

B. Install pumps in locations and arranged to provide access for periodic maintenance, including removal of motors, impellers, couplings, and accessories. See detail on drawings.

C. Support pumps and piping separately so that the weight of the piping system does not rest on the pump.

D. Pumps shall have suction diffusers, flexible connections, and triple duty valves.

2.6 CONNECTIONS

A. General: Install valves that are same size as the piping connecting the pump. Triple duty valve shall be sized by pump manufacturer.

B. Install a pump suction diffuser and butterfly valve on the suction side of pumps. (Refer to schedules for pumps that require suction diffusers.)

C. Install pressure gages on the suction and discharge of each pump at the integral pressure gage tappings provided- utilize trumpet valve arrangement.

D. Install temperature and pressure gage connector plugs in suction and discharge piping around pump.

2.7 COMMISSIONING

A. Final Checks Before Start-Up: Perform the following preventative maintenance operations and checks before start-up:

B. Lubricate oil-lubricated bearings.

C. Remove grease-lubricated bearing covers and flush the bearings with kerosene and thoroughly clean. Fill with new lubricant in accordance with the manufacturer's recommendations.

D. Disconnect coupling and check motor for proper rotation. Rotation shall match direction of rotation marked on pump casing.

E. Pumps shall be installed and operated prior to trimming impellers. Determine system curve, remove impeller and trim to match system curve allowing for future addition if applicable.

END OF SECTION 23 21 23

SECTION 23 25 00 - HVAC WATER TREATMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following HVAC water-treatment systems:

1. Bypass chemical-feed equipment and controls.
2. Chemical treatment test equipment.
3. HVAC water-treatment chemicals.
4. The project involves closed loops (air-cooled chillers and boilers- primary/secondary pumping). The site water shall be tested and the engineer notified of the results. Do not include any potable water conditioners in the base bid. Provide cleaning, flushing, inhibitors, etc. for the piping as shown on the drawings.
5. NOTE: Boilers have aluminum heat exchangers- verify boiler mfg. requirements for water chemistry and adjust as necessary.

1.3 DEFINITIONS

A. EEPROM: Electrically erasable, programmable read-only memory.

B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

C. TDS: Total dissolved solids.

D. UV: Ultraviolet.

1.4 PERFORMANCE REQUIREMENTS

A. Water quality for HVAC systems shall minimize corrosion, scale buildup, and biological growth for optimum efficiency of HVAC equipment without creating a hazard to operating personnel or the environment.

B. Base HVAC water treatment on quality of water available at Project site, HVAC system equipment material characteristics and functional performance characteristics, operating personnel capabilities, and requirements and guidelines of authorities having jurisdiction.

C. Closed hydronic systems, including hot-water heating, chilled water, shall have the following water qualities:

1. pH: Maintain a value within 8.0 to 8.5 (NOTE- Confirm with each piece of equipment- aluminum heat exchangers have much tighter pH requirements- adjust as necessary).
2. "P" Alkalinity: Maintain a value within 100 to 500 ppm.
3. Boron: Maintain a value within 100 to 200 ppm.
4. Chemical Oxygen Demand: Maintain a maximum value of 100 ppm.
5. Soluble Copper: Maintain a maximum value of 0.20 ppm.

6. TDS: Maintain a maximum value of 10 ppm.
7. Ammonia: Maintain a maximum value of 20 ppm.
8. Free Caustic Alkalinity: Maintain a maximum value of 20 ppm.
9. Microbiological Limits:

    a. Total Aerobic Plate Count: Maintain a maximum value of 1000 organisms/ml.
    b. Total Anaerobic Plate Count: Maintain a maximum value of 100 organisms/ml.
    c. Nitrate Reducers: Maintain a maximum value of 100 organisms/ml.
    d. Sulfate Reducers: Maintain a maximum value of 0 organisms/ml.
    e. Iron Bacteria: Maintain a maximum value of 0 organisms/ml.

D. Passivation for Galvanized Steel: For the first 60 days of operation.

1. pH: Maintain a value within 7 to 8.
2. Calcium Carbonate Hardness: Maintain a value within 100 to 300 ppm.
3. Calcium Carbonate Alkalinity: Maintain a value within 100 to 300 ppm.

1.5 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for the following products:

1. Bypass feeders.
2. Water meters.
3. Inhibitor injection timers.
4. pH controllers.
5. TDS controllers.
6. Biocide feeder timers.
7. Chemical solution tanks.
8. Injection pumps.
9. Chemical test equipment.
10. Chemical material safety data sheets.
11. Self-cleaning strainers.
12. Centrifugal separators.

B. Shop Drawings: Pretreatment and chemical treatment equipment showing tanks, maintenance space required, and piping connections to HVAC systems. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: Power and control wiring.

C. Field quality-control test reports.

D. Manufacturer Seismic Qualification Certification: Submit certification that water filtration units and components will withstand seismic forces defined in Division 23 Section "Mechanical Vibration and Seismic Controls." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Operation and Maintenance Data: For sensors, injection pumps, water filtration units, and controllers to include in emergency, operation, and maintenance manuals.

F. Other Informational Submittals:

1. Water-Treatment Program: Written sequence of operation on an annual basis for the application equipment required to achieve water quality defined in the "Performance Requirements" Article above.
2. Water Analysis: Illustrate water quality available at Project site.
3. Passivation Confirmation Report: Verify passivation of galvanized-steel surfaces, and confirm this observation in a letter to Architect.

1.6 QUALITY ASSURANCE

A. HVAC Water-Treatment Service Provider Qualifications: An experienced HVAC water-treatment service provider capable of analyzing water qualities, installing water-treatment equipment, and applying water treatment as specified in this Section.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 MAINTENANCE SERVICE

A. Scope of Maintenance Service: Provide chemicals and service program to maintain water conditions required above to inhibit corrosion, scale formation, and biological growth for cooling, chilled-water piping, heating, hot-water piping and equipment. Services and chemicals shall be provided for a period of one year from date of Substantial Completion, and shall include the following:

1. Initial water analysis and HVAC water-treatment recommendations.
2. Startup assistance for Contractor to flush the systems, clean with detergents, and initially fill systems with required chemical treatment prior to operation.
3. Periodic field service and consultation.
4. Customer report charts and log sheets.
5. Laboratory technical analysis.
6. Analyses and reports of all chemical items concerning safety and compliance with government regulations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ampion Corp.

2. Anderson Chemical Co, Inc.
3. Aqua-Chem, Inc.; Cleaver-Brooks Div.
4. Barclay Chemical Co.; Water Management, Inc.
5. Boland Trane Services
6. GE Betz.
7. GE Osmonics.
8. H-O-H Chemicals, Inc.
9. Metro Group. Inc. (The); Metropolitan Refining Div.
10. ONDEO Nalco Company.
11. Watcon, Inc.

2.2 MANUAL CHEMICAL-FEED EQUIPMENT

A. Bypass Feeders: Steel, with corrosion-resistant exterior coating, minimum 3-1/2-inch (89-mm) fill opening in the top, and NPS 3/4 (DN 20) bottom inlet and top side outlet. Quarter turn or threaded fill cap with gasket seal and diaphragm to lock the top on the feeder when exposed to system pressure in the vessel.

1. Capacity: 5 gal. (19 L).
2. Minimum Working Pressure: 125 psig (860 kPa).

2.3 STAINLESS-STEEL PIPES AND FITTINGS

A. Stainless-Steel Tubing: Comply with ASTM A 269, Type 316.

B. Stainless-Steel Fittings: Complying with ASTM A 815/A 815M, Type 316, Grade WP-S.

C. Two-Piece, Full-Port, Stainless-Steel Ball Valves: ASTM A 351, Type 316 stainless-steel body; ASTM A 276, Type 316 stainless-steel stem and vented ball, carbon-filled TFE seats, threaded body design with adjustable stem packing, threaded ends, and 250-psig (1725-kPa) SWP and 600-psig (4140-kPa) CWP ratings.

D. Three-Piece, Full-Port, Stainless-Steel Ball Valves: ASTM A 351, Type 316 stainless-steel body; ASTM A 276, Type 316 stainless-steel stem and vented ball, threaded body design with adjustable stem packing, threaded ends, and 150-psig (1035-kPa) SWP and 600-psig (4140-kPa) CWP rating.

2.4 CHEMICAL TREATMENT TEST EQUIPMENT

A. Test Kit: Manufacturer-recommended equipment and chemicals in a wall-mounting cabinet for testing pH, TDS, inhibitor, chloride, alkalinity, and hardness; sulfite and testable polymer tests for high-pressure boilers, and oxidizing biocide test for open cooling systems.

B. Sample Cooler:

1. Tube: Sample.

a. Size: NPS 1/4 (DN 8) tubing.
b. Material: ASTM A 666, Type 316 stainless steel.
c. Pressure Rating: Minimum 2000 psig (13 790 kPa).
d. Temperature Rating: Minimum 850 deg F (454 deg C).

2. Shell: Cooling water.

a. Material: ASTM A 666, Type 304 stainless steel.

b. Pressure Rating: Minimum 250 psig (1725 kPa).
c. Temperature Rating: Minimum 450 deg F (232 deg C).

3. Capacities and Characteristics:

a. Tube: Sample.

1) Flow Rate: 0.25 gpm (0.016 L/s).
2) Entering Temperature: 400 deg F (204 deg C).
3) Leaving Temperature: 88 deg F (31 deg C).
4) Pressure Loss: 6.5 psig (44.8 kPa).

b. Shell: Cooling water.

1) Flow Rate: 3 gpm (0.19 L/s).
2) Entering Temperature: 70 deg F (21 deg C).
3) Pressure Loss: 1.0 psig (6.89 kPa).

C. Corrosion Test-Coupon Assembly: Constructed of corrosive-resistant material, complete with piping, valves, and mild steel and copper coupons. Locate copper coupon downstream from mild steel coupon in the test-coupon assembly.

1. Two-station rack for closed-loop systems.
2. Four-station rack for open systems.

2.5 CHEMICALS

A. Chemicals shall be as recommended by water-treatment system manufacturer that are compatible with piping system components and connected equipment, and that can attain water quality specified in Part 1 "Performance Requirements" Article.

B. Water Softener Chemicals:

1. Mineral: High-capacity, sulfonated-polystyrene ion-exchange resin that is stable over entire pH range with good resistance to bead fracture from attrition or shock. Resin exchange capacity minimum 30,000 grains/cu. ft. (69 kg/cu. m) of calcium carbonate of resin when regenerated with 15 lb (6.8 kg) of salt.
2. Salt for Brine Tanks: High-purity sodium chloride, free of dirt and foreign material. Rock and granulated forms are not acceptable.

C. Controls: Automatic; factory mounted on mineral tanks and factory wired.

1. Adjustable duration of regeneration steps.
2. Push-button start and complete manual operation override.
3. Pointer on pilot-control valve shall indicate cycle of operation.
4. Means of manual operation of pilot-control valve if power fails.
5. Main Operating Valves: Industrial, automatic, multiport, diaphragm type with the following features:

a. Slow opening and closing, nonslam operation.
b. Diaphragm guiding on full perimeter from fully open to fully closed.
c. Isolated dissimilar metals within valve.
d. Self-adjusting, internal, automatic brine injector that draws brine and rinses at constant rate independent of pressure.

e. Float-operated brine valve to automatically measure the correct amount of brine to the softener and refill with fresh water.
f. Sampling cocks for soft water.

6. Flow Control: Automatic control of backwash and flush rates over variations in operating pressures that do not require field adjustments.

D. Factory-Installed Accessories:

1. Piping, valves, tubing, and drains.
2. Sampling cocks.
3. Main-operating-valve position indicators.
4. Water meters.

E. Water Test Kit: Include water test kit in wall-mounting enclosure for water softener.

F. Self-Cleaning Strainers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:

a. Everfilt.
b. Hayward Industrial Products, Inc.
c. Islip Flow Controls Inc.
d. Orival, Inc.
e. Sure Flow Equipment, Inc.

4. Description: Factory-fabricated and -tested, ASTM A 126, Class B, cast-iron or steel, self-cleaning strainer system of tank, strainer, backwash arm or cleaning spiral, drive and motor, piping, and controls for removing particles from water.

a. Fabricate and label ASTM A 126, Class B, cast-iron or steel strainer tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
b. Pipe Connections:

1) NPS 2 (DN 50) and Smaller: Threaded according to ASME B1.20.1.
2) NPS 2-1/2 (DN 65) and Larger: Steel, Class 150 flanges according to ASME B16.5 or grooved according to AWWA C606.

5. Motorized Valves: Flanged or grooved-end, ductile-iron angle type with EPDM valve seat and stem seal; with ASTM B 148 aluminum bronze disc.
6. Strainer: ASTM A 666, Type 316 stainless steel.
7. Piping: ASTM A 53/A 53M, Type S, F, or E; Grade B, Schedule 40 black steel, with flanged, grooved, or threaded joints and malleable, steel welding, or ductile-iron fittings.
8. Safety Valves: Automatic pressure relief.
9. Backwash Arm Drive:

a. Drive Casing: Cast iron.
b. Worm Gears: Immersed in oil.

c. Motor: ODP motor supported on the strainer-bearing frame. General requirements for motors are specified in Division 23 Section "Motors."

10. Controls: Automatic control of backwash; factory wired for single electrical connection.

a. Panel: NEMA 250, Type 4 enclosure with time clock and pressure gages.
b. Backwash Arm Drive: Automatic and manual switching; manual switch position bypasses safeties and controls.
c. Backwash: Automatic; with time clock and differential pressure switch.
d. Backwash Valve: Electric actuator.

11. Support: Skid mounting. Fabricate supports and base and attachment to tank with reinforcement strong enough to resist strainer movement during a seismic event when strainer base is anchored to building structure.

G. Centrifugal Separators:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:

a. Alamo Water Treatment; Ecodyne Water Treatment, Inc.
b. Culligan International.
c. Griswold Controls.
d. LAKOS; a div. of Claude Laval Corporation.
e. PEP Filters, Inc.
f. Puroflux Corporation.
g. Rosedale Products, Inc.
h. USFilter.

4. Description: Simplex separator housing with baffles and chambers for removing particles from water by centrifugal action and gravity.
5. Housing: With manufacturer's proprietary system of baffles and chambers.

a. Construction: Fabricate and label steel separator housing to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
b. Inlet: Designed with tangential entry to produce centrifugal flow of feedwater.
c. Vortex Chamber: Designed for downward vortex flow and gravity separation of particles.
d. Collection Chamber: Designed to hold separated particles.
e. Outlet: Near top of unit.
f. Purge: At bottom of collection chamber.
g. Pipe Connections NPS 2 (DN 50) and Smaller: Threaded according to ASME B1.20.1.
h. Pipe Connections NPS 2-1/2 (DN 65) and Larger: Steel, Class 150 flanges according to ASME B16.5 or grooved according to AWWA C606. Provide stainless-steel flanges if tank is stainless steel.

6. Motorized Purge Valve: Gate or plug pattern valve.

a. Motorized Valves: Butterfly-type, flanged or grooved-end, ductile-iron body, with EPDM valve seat and stem seal; with ASTM B 148 aluminum bronze disc.

7. Strainer: Stainless-steel basket type mounted on pump suction.
8. Piping: ASTM A 53/A 53M, Type S, F, or E; Grade B, Schedule 40 black steel, with flanged, grooved, or threaded joints and malleable, steel welding, or ductile-iron fittings.
9. Piping: ASTM B 88, Type L (ASTM B 88M, Type B) copper water tube, copper-alloy solder-joint fittings, and brazed, flanged, or grooved joints.
10. Circulating Pump: Overhung impeller, close coupled, single stage, end suction, centrifugal. Comply with UL 778 and with HI 1.1-1.2 and HI 1.3.

    a. Casing: Radially split, cast iron.
    b. Pressure Rating: 125 psig (860 kPa) minimum.
    c. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, closed, and keyed to shaft.
    d. Shaft and Shaft Sleeve: Steel shaft, with copper-alloy shaft sleeve.
    e. Seal: Mechanical.
    f. Motor: ODP motor supported on the pump-bearing frame. General requirements for motors are specified in Division 23 Section "Motors."

11. Controls: Automatic control of circulating pump and separator purge; factory wired for single electrical connection.

    a. Panel: NEMA 250, Type 4 enclosure.
    b. Pump: Automatic and manual switching; manual switch position bypasses safeties and controls.
    c. Separator Purge: Automatic and manual.
    d. TDS Controller Interlock: Open separator purge valve with bleed-off control.

PART 3 - EXECUTION

3.1 WATER ANALYSIS

A. Perform an analysis of supply water to determine quality of water available at Project site.

3.2 INSTALLATION

A. Install chemical application equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate.

B. Install seismic restraints for equipment and floor-mounting accessories and anchor to building structure. Refer to Division 23 Section "Mechanical Vibration and Seismic Controls" for seismic restraints.

C. Install water testing equipment on wall near water chemical application equipment.

D. Install interconnecting control wiring for chemical treatment controls and sensors.

E. Mount sensors and injectors in piping circuits.

F. Bypass Feeders: Install in closed hydronic systems, including hot-water heating, and chilled water and equipped with the following:

1. Install bypass feeder in a bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
2. Install water meter in makeup water supply.
3. Install test-coupon assembly in bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
4. Install a gate or full-port ball isolation valves on inlet, outlet, and drain below feeder inlet.
5. Install a swing check on inlet after the isolation valve.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with dielectric fittings. Dielectric fittings are specified in Division 23 Section "Basic Mechanical Materials and Methods."

D. Install shutoff valves on HVAC water-treatment equipment inlet and outlet. Metal general-duty valves are specified in Division 23 Section "Valves."

E. Refer to Division 23 Section "Domestic Water Piping Specialties" for backflow preventers required in makeup water connections to potable-water systems.

F. Confirm applicable electrical requirements in Division 26 Sections for connecting electrical equipment.

G. Ground equipment according to Division 26 Section "Grounding and Bonding."

H. Connect wiring according to Division 26 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Inspect field-assembled components and equipment installation, including piping and electrical connections.
2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
3. Place HVAC water-treatment system into operation and calibrate controls during the preliminary phase of HVAC systems' startup procedures.
4. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.

5. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
6. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
7. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow test pressure to stand for four hours. Leaks and loss in test pressure constitute defects.
8. Repair leaks and defects with new materials and retest piping until no leaks exist.

D. Remove and replace malfunctioning units and retest as specified above.

E. Sample boiler water at one-week intervals after boiler startup for a period of five weeks, and prepare test report advising Owner of changes necessary to adhere to Part 1 "Performance Requirements" Article for each required characteristic. Sample boiler water at four-week intervals following the testing noted above to show that automatic chemical-feed systems are maintaining water quality within performance requirements specified in this Section.

F. At four-week intervals following Substantial Completion, perform separate water analyses on hydronic systems to show that automatic chemical-feed systems are maintaining water quality within performance requirements specified in this Section. Submit written reports of water analysis advising Owner of changes necessary to adhere to Part 1 "Performance Requirements" Article.

G. Comply with ASTM D 3370 and with the following standards:

1. Silica: ASTM D 859.
2. Steam System: ASTM D 1066.
3. Acidity and Alkalinity: ASTM D 1067.
4. Iron: ASTM D 1068.
5. Water Hardness: ASTM D 1126.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC water-treatment systems and equipment. Refer to Division 1 Section "Demonstration and Training."

B. Training: Provide a "how-to-use" self-contained breathing apparatus video that details exact operating procedures of equipment.

END OF SECTION 23 25 00

SECTION 23 31 00 - METAL DUCTWORK
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

This Section includes rectangular, oval, double wall, underslab and round metal ducts and plenums for heating, ventilating, and air conditioning systems.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. The duct system design, as indicated, has been used to select and size air moving and distribution equipment and other components of the air system. Changes or alterations to the layout or configuration of the duct system must be specifically approved in writing. Accompany requests for layout modifications with calculations showing that the proposed layout will provide the original design results without increasing the system total pressure.

B. Coordinate ductwork installation with ceiling suspension members; with other systems installed in the same space with the duct systems; with ceiling- and wall-mounted access doors and panels required to provide access to dampers and other operating devices; with ceiling-mounted lighting fixtures and air outlets and inlets.

1.4 QUALITY ASSURANCE

NFPA Compliance: Comply with the following NFPA Standards:

NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," except as indicated otherwise.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Sheet Metal, General: Provide sheet metal in thicknesses indicated, packaged and marked as specified in ASTM A 700.

B. Galvanized Sheet Steel: Lock-forming quality, ASTM A 527, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.

2.2 FIRE-STOPPING

A. Fire-Resistant Sealant: Provide two-part, foamed-in-place, fire-stopping silicone sealant formulated for use in a through-penetration fire-stop system for filling openings around duct penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

B. Fire-Resistant Sealant: Provide one-part elastomeric sealant formulated for use in a through-penetration fire-stop system for filling openings around duct penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

C. Products: Subject to compliance with requirements, provide one of the following:

1. "Dow Corning Fire Stop Foam"; Dow Corning Corp.
2. "Pensil 851"; General Electric Co.
3. "Dow Corning Fire Stop Sealant"; Dow Corning Corp.
4. "3M Fire Barrier Caulk CP-25"; Electrical Products Div./3M. "RTV 7403"; General Electric Co.
5. "Fyre Putty"; Standard Oil Engineered Materials Co.

2.3 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder actuated fasteners, or structural steel fasteners appropriate for building materials. Do not use powder actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4 inches thick.

B. Hangers: Galvanized sheet steel, or round, uncoated steel, threaded rod.

C. Hangers Installed In Corrosive Atmospheres:
D. Electro-galvanized, all-thread rod or hot-dipped-galvanized rods with threads painted after installation.

E. Straps and Rod Sizes: Conform with Table 4-1 in SMACNA HVAC Duct Construction Standards, 1985 Edition, for sheet steel width and gage and steel rod diameters.

F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

G. Trapeze and Riser Supports: Steel shapes conforming to ASTM A 36.

H. Where galvanized steel ducts are installed, provide hot-dipped-galvanized steel shapes and plates.

2.4 RECTANGULAR DUCT FABRICATION

A. General: Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards." Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.

B. Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.

C. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

D. Static Pressure Classifications: Except where otherwise indicated, construct duct systems to the following pressure classifications:

E. Supply Ducts: 3 inches water gage. (Low pressure duct downstream of VAV's : 2 inches water gage)

F. Return Ducts: 2 inches water gage, negative pressure.

G. Exhaust Ducts: 2 inches water gage, negative pressure.

H. Crossbreaking or Cross Beading: Crossbreak or bead duct sides that are 19 inches and larger and are 20 gage or less, with more than 10 sq. ft. of unbraced panel area, as indicated in SMACNA "HVAC Duct Construction Standard," Figure 1-4, unless they are are externally insulated.

2.5 RECTANGULAR DUCT FITTINGS

Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard," 1985 Edition, Figures 2-1 through 2-10. Provide turning vanes in all rectangular elbows and tees. Provide double thickness turning vanes in all elbows and tees where the largest dimension is greater than 36".

2.6 ROUND DUCT FABRICATION

Round Ducts: Fabricate round supply ducts with spiral lockseam construction. Comply with SMACNA "HVAC Duct Construction Standards," Table 3-2 for galvanized steel gages.

2.7 DOUBLE WALL DUCT AND FITTINGS

Double wall duct and fittings shall be factory fabricated with a solid galvanized steel outer pressure shell and a perforated galvanized steel inner layer with 2" of insulation sandwiched between (1.55 pounds per cubic foot density). Insulation shall be held in place by the liner without use of pins and fasteners. Provide rectangular or round duct as shown on plans. Install on first twenty (20) feet of supply and return. Provide round, oval, flat oval as shown or required.

2.8 ROUND/OVAL SUPPLY AND EXHAUST FITTINGS FABRICATION

A. 90-Degree Tees and Laterals and Conical Tees: Fabricate to conform to SMACNA "HVAC Duct Construction Standards," 1985 Edition, Figures 3-4 and 3-5 and with metal thicknesses specified for longitudinal seam straight duct.

B. Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate the bend radius of die-formed, gored, and pleated elbows 1.5 times the elbow diameter. Unless elbow construction type is indicated, provide elbows meeting the following requirements:

C. Round Elbows - 8 Inches and Smaller: Die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30 and 60 degrees only. Fabricate nonstandard bend angle configurations or 1/2-inch-diameter (e.g. 3-1/2- and 4-1/2-inch) elbows with gored construction.

D. Round Elbows - 9 Through 14 Inches: Gored elbows for 30, 45, 60, and 90 degrees, except where space restrictions require a mitered elbow. Fabricate nonstandard bend angle configurations or 1/2-inch-diameter (e.g. 9-1/2- and 10-1/2-inch) elbows with gored construction.

E. Fittings shown or indicated on the drawing shall be utilized as this system was modeled and sized for static regain. Changes in the duct or fittings will impact performance- notify engineer of any proposed changes for approval.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION, GENERAL

A. Duct System Pressure Class: Construct and install each duct system for the specific duct pressure classification indicated.

B. Install ducts with the fewest possible joints.

C. Use fabricated fittings for all changes in directions, changes in size and shape, and connections.

D. Install couplings tight to duct wall surface with projections into duct at connections kept to a minimum.

E. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct useable space or block access for servicing building and its equipment.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

G. Provide clearance of 1 inch where furring is shown for enclosure or concealment of ducts, plus allowance for insulation thickness, if any.

H. Install insulated ducts with 1-inch clearance outside of insulation.

I. Conceal ducts from view in finished and occupied spaces by locating in mechanical shafts, hollow wall construction, or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown.

J. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

K. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

L. Non-Fire-Rated Partition Penetrations: Where ducts pass interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2 inches.

M. Pressure Classification Less than 2 Inches Water Gage:
N. Transverse joints only.

O. Seal externally insulated ducts prior to insulation installation.

3.2 HANGING AND SUPPORTING

A. Install rigid round and rectangular metal duct with support systems indicated in SMACNA "HVAC Duct Construction Standards," Tables 4-1 through 4-3 and Figures 4-1 through 4-8.

B. Support horizontal ducts within 2 feet of each elbow and within 4 feet of each branch intersection.

C. Support vertical ducts at a maximum interval of 16 feet and at each floor.

D. Upper attachments to structures shall have an allowable load not exceeding 1/4 of the failure (proof test) load but are not limited to the specific methods indicated.

E. Install concrete insert prior to placing concrete.

F. Install powder actuated concrete fasteners after concrete is placed and completely cured.

END OF SECTION 23 31 00

SECTION 23 33 00 - DUCT ACCESSORIES - MECHANICAL

PART 1 - GENERAL

1.1RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

This Section includes the following:

A. Backdraft dampers.
B. Fire and smoke dampers.
C. Duct-mounted access doors and panels.
D. Flexible connectors.
E. Flexible ducts.
F. Accessories hardware.
G. Sound attenuators

MC shall be responsible for testing and inspections of all fire dampers per NFPA 80 chapter 19. Inspections and testing shall be documented indicating the location of the fire damper or combination fire/ smoke damper, date of inspection, name of inspector, and deficiencies discovered. The documentation shall have a space to indicate when and how the deficiencies were corrected.

Provide unit prices for 24x24 fire damper and 24x24 combination fire smoke dampers if any are needed to be added.

1.3 SUBMITTALS

Product data including details for materials, dimensions of individual components, profiles, and finishes for the following items:
Backdraft dampers.
Fire and smoke dampers.
Duct-mounted access panels and doors.
Flexible ducts.
Sound attenuators

1.4 EXTRA MATERIALS

Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels describing contents. Deliver extra materials to Owner.

Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 BACKDRAFT DAMPERS

Description: Suitable for horizontal or vertical installation.

Frame: 0.063-inch-thick 6063T extruded aluminum, with mounting flange.

Blades: 0.025-inch-thick roll-formed aluminum.
Blade Seals: Neoprene.

Blade Axles: Nonferrous.
Tie Bars and Brackets: Aluminum.
Return Spring: Adjustable tension.

2.2 FIRE DAMPERS

General: UL labeled according to UL Standard 555 "Standard for Fire Dampers."
Fire Rating: 1-1/2 or 3 hours, as indicated.
Frame: Type B; fabricated with roll-formed, 21-gage,galvanized-steel; with mitered and interlocking corners.
Mounting Sleeve: Factory-installed or field-installed galvanized steel.
Minimum Thickness: 0.056-inch (16-gage) or 0.138-inch (10-gage) thick as indicated, and length to suit application.
Mounting Orientation: Vertical or horizontal as indicated.
Blades: Roll-formed, interlocking, 21-gage galvanized steel. In place of interlocking blades, provide full-length, 21-gage, galvanized-steel blade connectors.
Horizontal Dampers: Include a blade lock and stainless steel negator closure spring.
Fusible Link: Replaceable, 212 deg F rated as indicated.

2.3 CEILING FIRE DAMPERS

General: UL listed and labeled; comply with the construction details for the tested floor/roof-ceiling assemblies as indicated in the UL Fire Resistance Directory.
Frame: 20-gage, rectangular or round, galvanized steel; style to suit ceiling construction.
Blades: 22-gage galvanized steel with nonasbestos refractory insulation.
Volume Control Adjustment: Provide UL-labeled, fusible volume control adjustment.
Fusible Link: Replaceable, 212 deg F rated.

2.4 SMOKE DAMPERS

General: UL-labeled according to UL Standard 555S, "Standard for Leakage Rated Dampers for Use in Smoke Control Systems." Combination fire and smoke dampers shall also be UL-labeled for 1-1/2 hour rating according to UL Standard 555 "Standard for Fire Dampers."
Fusible Link: Replaceable, 212 deg F rated as indicated.
Frame and Blades: 16-gage galvanized steel.

Mounting Sleeve: Factory-installed, 18-gage galvanized steel, length to suit wall or floor application.

2.5 DUCT-MOUNTED ACCESS DOORS AND PANELS

General: Provide construction and airtightness suitable for duct pressure class.

Frame: Galvanized sheet steel. Provide with bend-over tabs and foam gaskets.

Door: Double-wall, galvanized sheet metal construction with insulation fill and thickness, number of hinges and locks as indicated for duct pressure class. Provide vision panel where indicated. Provide 1-inch by 1-inch butt hinge or piano hinge and cam latches.

Seal around frame attachment to duct and door to frame with neoprene or foam rubber seals.

Insulation: 1-inch thick fiber glass or polystyrene foam board.

2.6 FLEXIBLE CONNECTORS

General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL Standard 181, Class 1.

Standard Metal-Edged Connectors: Factory-fabricated with a strip of fabric 3-1/2 inches wide attached to 2 strips of 2-3/4-inch-wide, 24-gage, galvanized sheet steel or 0.032-gage aluminum sheets. Select metal compatible with connected duct system. Fold and crimp metal edge strips onto fabric as illustrated in SMACNA HVAC Duct Standard, 1st Edition, Figure 2-19.

2.7 FLEXIBLE DUCTS

General: Comply with UL 181, Class 1.

Flexible Ducts - Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch-thick, glass fiber insulation around a continuous inner liner.
Reinforcement: Steel-wire helix encapsulated in the inner liner.
Outer Jacket: Glass-reinforced, silver mylar with a continuous hanging tab, integral fiber glass tape, and nylon hanging cord.

Outer Jacket: Polyethylene film.

Inner Liner: Polyethylene film.

Attach with stainless steel worm drive clamps.

2.8 ACCESSORIES HARDWARE

Splitter Damper Accessories: Zinc-plated damper blade bracket, 1/4-inch, zinc-plated operating rod, and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.

Adhesives: High strength, quick setting, neoprene based, waterproof and resistant to gasoline and grease.

2.9 SOUND ATTENUATORS

United McGill, Rink, or Industrial Acoustics Duct Silencers. Outer casing shall be galvanized steel, minimum 22 gauge. Baffles shall be made of perforated, galvanized steel, minimum 24 gauge, filled with sound absorbing insulation that will not settle or promote growth of bacteria, mold, vermin, or insects. The insulation shall be erosion resistant and enclosed in a polymer bag with all edges sealed airtight. Fill shall be tested in accordance with UL 723 procedures and meet NFPA 90A requirements (flame spread rating not over 25 without evidence of continued progressive combustion and a smoke developed rating no higher than 50). Silencers shall have low pressure drop.

PART 3 - EXECUTION

3.1 INSTALLATION

Install duct accessories according to manufacturer's installation instructions and applicable portions of details of construction as shown in SMACNA standards.
Provide test holes at fan inlet and outlet and elsewhere as indicated.
Install fire and smoke dampers according to the manufacturer's UL-approved instructions.
Install fusible links in fire dampers.
Install access doors of sufficient size and location to reset all dampers.

Provide access doors at all locations required to maintain control devices such as dampers, airflow monitoring stations, etc.

Install ionization detectors as per manufacturer's instructions. Wire to shut down unit.

END OF SECTION 23 33 00

SECTION 23 34 00 - POWER VENTILATORS AND KITCHEN HOODS

PART 1 - GENERAL

Consult schedules on plans for model numbers and capacities.

1.1 SUMMARY

This Section includes the following:

A. Centrifugal roof ventilators.
B. Ceiling-mounting ventilators.
C. In-line centrifugal fans.
D. Kitchen hoods
E. Utility Chases

1.2 PERFORMANCE REQUIREMENTS

Operating Limits: Classify according to AMCA 99.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material gages and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.

B. Maintenance Data: For power ventilators to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

1.5 COORDINATION

Coordinate installation of roof curbs, equipment supports, and roof penetrations.

1.6 PRODUCTS

1.7 MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Centrifugal Roof Ventilators:

   A. Carnes Company HVAC.
   B. Cook, Loren Company.
   C. Greenheck Fan Corp.
   D. ILG Industries, Inc./American Coolair Corp.
   E. Penn Ventilation Companies, Inc.

2. Ceiling-Mounting Ventilators:

   A. Carnes Company HVAC.
   B. Cook, Loren Company.
   C. Greenheck Fan Corp.
   D. ILG Industries, Inc./American Coolair Corp.
   E. Penn Ventilation Companies, Inc.

3. In-Line Centrifugal Fans:

   A. Carnes Company HVAC.
   B. Cook, Loren Company.
   C. Greenheck Fan Corp.
   D. ILG Industries, Inc./American Coolair Corp.
   E. Penn Ventilation Companies, Inc.

4. Kitchen Hoods:

   A. CaptiveAire
   B. Greenheck
   C. Grease-Master

1.8 CENTRIFUGAL ROOF VENTILATORS

A. Description: Belt-driven or direct-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.

B. Housing: Removable, spun-aluminum, dome top and outlet baffle one-piece, aluminum base with venturi inlet cone.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:

E. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
F. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
G. Pulleys: Cast-iron, adjustable-pitch motor pulley.

H. Fan and motor isolated from exhaust airstream.

I. Accessories:

J. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit. Provide factory wired/installed speed control for T&B adjustment of all direct drive fans.

K. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
L. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.

M. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

N. Configuration: Built-in raised cant and mounting flange.

O. Overall Height: 16 inches- increase as required to maintain minimum 12" above the roof surface.

1.9 CEILING-MOUNTING VENTILATORS

A. Description: Centrifugal fans designed for installing in ceiling.

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories: Provide factory mounted service disconnect. Provide factory wired/installed speed control for T&B adjustment of all direct drive fans.

1.10 IN-LINE CENTRIFUGAL FANS

A. Description: In-line, belt-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.

B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable for ceiling mounting.

C. Direct-Driven Units: Motor encased in housing outside of airstream, factory wired to disconnect switch located on outside of fan housing. Provide factory wired/installed speed control for T&B adjustment of all direct drive fans.

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories:
G. Companion Flanges: For inlet and outlet duct connections.

H. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

1.11 MOTORS

A. Refer to Division 23 Section "Motors" for general requirements for factory-installed motors.

B. Motor Construction: NEMA MG 1, general purpose, continuous duty, Design B.

C. Enclosure Type: Open dripproof.

1.12 SOURCE QUALITY CONTROL

Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

1.13 KITCHEN HOOD: (OMIT SECTION WHEN NOT APPICABLE- REFER TO DRAWINGS)

A. Kitchen hood construction and installation, along with the associated exhaust duct system, shall be in accordance with NFPA 96, NSF, state and local codes. Hood shall be Type 1 as per the NC Mechanical Code.

B. All accessories specified herein or as shown on the drawings shall be UL labeled.

C. Kitchen exhaust hood shall be 18 gauge, stainless steel, all welded construction. Unit shall be insulated per NFPA 96 with 1" mineral wool insulation.

D. All seams, joints, and penetrations of surfaces which directly contain or convey grease laden vapors, shall have a liquid tight continuous external weld. Caulking will not be acceptable.

E. Grease filters shall be baffle-type installed in multiple "v" units. Each filter shall be 20" x 20" x 2" thick. The filter manufacturer shall provide end plates, bottom plates, brackets, drip pan, holding frames and all other accessories required for a complete filter assembly. Flame Guard or approved equivalent. Filters shall be UL listed.

F. Kitchen hood lights shall be heat-proof with vapor-proof glass, fiber gasket. Lighting shall provide a minimum of 50 fc under the hood- increase fixtures/wattage as required. Provide all fixtures and lamps.

G. Kitchen hood exhaust duct shall be 16 gauge welded black steel encased with UL listed Grease Ductwrap for 0" clearance to combustibles and either 1 hour or 2 hour rated protection to match architectural ratings. All grease duct shall be wrapped from hood outlet to just above the roof penetration even if no required fire rated assemblies are penetrated for added protection.

H. All seams and joints shall have a continuous external weld. Slope duct(s) towards grease filters. Access doors shall be installed in accordance with NFPA 96- at a minimum at each change of direction. Access openings shall have airtight and grease tight covers. Covers shall be of the same material and thickness as the duct or the surrounding exposed metal inside the hood.

I. Field measure the wrapper panel before ordering- adjust height as required for the ceiling.

J. Provide heat detector to automatically start hood. Hood shall UL listed fire suppression system- coordinate pull station location(s) with AHJ and locate as directed. Provide a natural gas solenoid valve so that when the system is activated, the gas will shut off. Also the hood exhaust fan must remain operational during a fire event. Adjust discharge nozzles over the appliances.

K. Provide stainless steel utility chase under hood- provide light switch and manual fan switch on utility chase at 48" AFF. Coordinate with all kitchen equipment and locations to provide correct natural gas, water, and power connections for the appliances under the hood. Quick disconnects (stainless steel, PVC coated, NSF/AGA approved) for gas piping and water piping shall be provided. Order correct lengths to allow equipment shifting for cleaning without touching floor.

PART 2 EXECUTION

2.1 INSTALLATION

A. Install power ventilators and kitchen hood level and plumb.

B. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 7 Section "Roof Accessories" for installation of roof curbs.

C. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

D. Support suspended units from structure using threaded steel rods and vibration isolators.

E. Install units with clearances for service and maintenance.

F. Label units according to requirements specified in Division 23 Section "Mechanical Identification."

2.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

2.3 FIELD QUALITY CONTROL

Equipment Startup Checks:

A. Verify that shipping, blocking, and bracing are removed.
    1. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
    2. Verify that cleaning and adjusting are complete.
    3. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
    4. Verify lubrication for bearings and other moving parts.

B. Starting Procedures:

1. Energize motor and adjust fan to indicated rpm.
2. Measure and record motor voltage and amperage.

C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Shut unit down and reconnect automatic temperature-control operators.

F. Refer to Division 23 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.

G. Replace fan and motor pulleys as required to achieve design airflow.

H. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

2.4 ADJUSTING

A. Adjust belt tension.

B. Lubricate bearings.

2.5 CLEANING

A. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.

B. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

END OF SECTION 23 34 00

SECTION 23 36 00 - AIR TERMINALS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

VAV boxes Air terminals

1.2 SUBMITTALS

A. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.

B. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating air outlets with other items installed in ceilings responsibility of this contract.

D. Maintenance Data: List of parts for each type of air terminal and troubleshooting maintenance guide to include in the maintenance manuals specified in Division 1.

1.3 QUALITY ASSURANCE

A. Product Options: Drawings and schedules indicate requirements of air terminals and are based on specific systems indicated. Other manufacturers' systems with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

B. Listing and Labeling: Provide electrically operated air terminals specified in this Section that are listed and labeled.

a. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.

C. NFPA Compliance: Install air terminals according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

D. Comply with NFPA 70 for electrical components and installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide air terminals by one of the following or approved equal:

A. Carnes Co., Inc.
B. Envirotec, Inc.
C. Kreuger
D. Nailor Industries Inc.
E. Price
F. Trane Co. (The).

2.2 VAV BOXES AIR TERMINALS

A. Configuration: Volume-damper assembly and arrangement inside unit casing as per schedule on drawings. Locate control components inside protective metal shroud.

B. Casings: Steel or aluminum sheet metal of the following minimum thicknesses:

a) Upstream Pressure Side: 0.0239-inch steel.
b) Downstream Pressure Side: 0.0179-inch steel.
c) Upstream Pressure Side: 0.032-inch aluminum.
d) Downstream Pressure Side: 0.025-inch aluminum.

C. Casing Lining: Minimum of 1-inch- thick, neoprene- or vinyl-coated, fibrous-glass foil-faced insulation; 1.5-lb/cu. ft. density, complying with NFPA 90A requirements and UL 181 erosion requirements. Secure lining to prevent delamination, sagging, or settling.

D. Cover liner with Mylar film.

E. Plenum Air Inlets: Round stub connections or S-slip and drive connections for duct attachment.

F. Plenum Air Outlets: S-slip and drive connections.

G. Access: Removable panels to permit access to dampers and other parts requiring service, adjustment, or maintenance; with airtight gasket and quarter-turn latches.

H. Volume Damper: Construct of galvanized steel with peripheral gasket and self-lubricating bearings.

I. Maximum Damper Leakage: 2 percent of nominal airflow at 1-inch wg inlet static pressure.

J. Damper Position: Normally closed.

K. Hot-Water Heating Coil: 1/2-inch copper tube, mechanically expanded into aluminum-plate fins; leak tested underwater to 200 psig; and factory installed.

L. Electronic Controls: Bidirectional damper operator and microprocessor-based controller with integral airflow transducer and room sensor provide control with the following features:

M. Communication with temperature-control system specified in other Division 23 Sections.

N. Factory-mounted electronic controls to accomplish 23 09 93 Sequence of Operation.

O. The selected control vendor shall send the DDC controllers to the Vav box manufacturer for mounting or may be field installed and tested- coordinate prior to bid. The box manufacturer shall supply and mount a control transformer on all vav boxes on all boxes where applicable.

2.3 SOURCE QUALITY CONTROL

A. Testing Requirements: Test and rate air terminals according to ARI 880, "Industry Standard for Air Terminals."

B. Identification: Label each air terminal with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and ARI certification seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air terminals level and plumb, according to manufacturer's written instructions, rough-in drawings, original design, and referenced standards; and maintain sufficient clearance for normal service and maintenance. Note: Provide minimum of three duct diameters of straight inlet duct- duct to match box inlet size. No transitions, take-offs, or fittings shall be in this approach area.

B. Connect ductwork to air terminals according to Division 23 ductwork Sections.

3.2 CONNECTIONS

A. Install piping adjacent to air terminals to allow service and maintenance.

B. Hot-Water Piping: In addition to requirements in Division 23 Section "Hydronic Piping," connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.

C. Electrical: Comply with applicable requirements in Division 26 Sections.

D. Ground equipment.

E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 CLEANING

After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes.

3.5 COMMISSIONING

A. Verify that installation of each air terminal is according to the Contract Documents.

B. Check that inlet duct connections are as recommended by air terminal manufacturer to achieve proper performance.

C. Check that controls and control enclosure are accessible.

D. Verify that control connections are complete.

E. Check that nameplate and identification tag are visible.

F. Verify that controls respond to inputs as specified.

3.6 DEMONSTRATION

Review data in the maintenance manuals. Refer to Division 1 Operation and Maintenance Data" Schedule training with Owner, with at least 7 days' advance notice.

END OF SECTION 23 36 00

SECTION 23 37 00 - MECHANICAL -
AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Types of air outlets and inlets required for project include the following:

1. Ceiling air diffusers.
2. Wall registers and grilles.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of air outlets and inlets of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Codes and Standards:

1. ADC Seal: Provide air outlets and inlets bearing ADC Certified Rating Seal.
2. AMCA Seal: Provide louvers bearing AMCA Certified Rating Seal.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data for air outlets and inlets including the following:

B. Schedule of air outlets and inlets indicating drawing designation, room location, number furnished, model number, size, and accessories furnished.

C. Data sheet for each type of air outlet and inlet, and accessory furnished; indicating construction, finish, and mounting details.

PART 2 - PRODUCTS

2.1 GRILLES, REGISTERS AND DIFFUSERS:

A. General: Except as otherwise indicated, provide manufacturer's standard grilles, registers and diffusers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.

B. Performance: Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.

C. Ceiling Compatibility: Provide border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.

D. Types: Provide type, capacity, and with accessories and finishes as listed on grille, register and diffuser schedule.

E. Manufacturers: Subject to compliance with requirements, provide diffusers of one of the following:

a. Carnes Co.; Div. of Wehr Corp.
b. Kreuger
c. Metalaire
d. Price
e. Titus Products Div.; Philips Industries, Inc.
f. Tuttle & Bailey; Div. of Interpace Corp.

2.2 LOUVERS:

A. General: Except as otherwise indicated, provide manufacturer's standard louvers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation. Field measure prior to ordering. Provide flange if required. Utilize brick and block coursing where practical.

B. Performance: Provide louvers that have minimum free area, and maximum pressure drop for each type as listed in manufacturer's current data, complying with louver schedule.

C. Substrate Compatibility: Provide louvers with frame and sill styles that are compatible with adjacent substrate, and that are specifically manufactured to fit into construction openings with accurate fit and adequate support, for weatherproof installation. Refer to general construction drawings and specifications for types of substrate which will contain each type of louver.

D. Materials: Construct of aluminum extrusions, ASTM B 221, Alloy 6063-T52. Weld units or use stainless steel fasteners.

E. Louver Screens: On inside face of exterior louvers, provide 1/2" square mesh anodized aluminum wire bird screens mounted in removable extruded aluminum frames.

F. Manufacturers: Subject to compliance with requirements, provide louvers of one of the following:

a) Airline Products Co.
b) American Warming & Ventilating, Inc.
c) Arrow United Industries, Inc.
d) Dowco Corp.
e) Louvers & Dampers, Inc.
f) Penn Ventilator Co., Inc.
g) Pottorff
h) Reliable Mfg.
i) Ruskin Mfg. Co.
j) Safe-Air Inc.
k) United Enertech
l) Vent Products Co., Inc.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended functions.

B. Locate ceiling air diffusers, registers, and grilles, as indicated on mechanical plans. Unless otherwise indicated, locate units in center of acoustical ceiling modules.

C. Grilles located in sheetrock ceilings shall have plaster rings to allow access to above the ceiling. Grilles in lay-in ceilings shall be 2x2 panels unless otherwise noted.

D. Provide galvanized steel lintel over all openings over 12" wide. Extend minimum 4" beyond on each side – consult lintel schedule and structural plans.

END OF SECTION 23 37 00

SECTION 23 37 23 - INTAKE AND RELIEF VENTILATORS

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

2.2 SUMMARY

A. This Section includes the following types of roof-mounting intake and relief ventilators:

1. Louver penthouses.
2. Roof hoods.
3. Goosenecks.

B. Related Sections include the following:

1. Division 10 Section "Louvers and Vents" for ventilator assemblies provided as part of the general construction.
2. Division 23 Section "Power Ventilators" for roof-mounting exhaust fans.

2.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Intake and relief ventilators shall be capable of withstanding the effects of gravity loads, wind loads, seismic loads, and thermal movements without permanent deformation of components, noise or metal fatigue, or permanent damage to fasteners and anchors.

2.4 SUBMITTALS

A. Product Data: For each type of product indicated. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For intake and relief ventilators. Include plans, elevations, sections, details, and ventilator attachments to curbs and curb attachments to roof structure.

C. Coordination Drawings: Roof framing plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members to which roof curbs and ventilators will be attached.
2. Sizes and locations of roof openings.

D. Samples for Verification: For each type of exposed finish required for intake and relief ventilators.

E. Welding certificates.

2.5 QUALITY ASSURANCE

A. Source Limitations: Obtain ventilators through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of intake and relief ventilators and are based on the specific equipment indicated. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2, "Structural Welding Code--Aluminum."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."

2.6 COORDINATION

A. Coordinate installation of roof curbs and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

PART 3 - PRODUCTS

3.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

3.2 MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005 with temper as required for forming or as otherwise recommended by metal producer for required finish.

C. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 (Z275) zinc coating, mill phosphatized.

D. Stainless-Steel Sheet: ASTM A 666, Type 304, with No. 4 finish.

E. Fasteners: Same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use hex-head or Phillips pan-head screws for exposed fasteners, unless otherwise indicated.

F. Post-Installed Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

3.3 FABRICATION, GENERAL

A. Factory or shop fabricate intake and relief ventilators to minimize field splicing and assembly. Disassemble units to the minimum extent as necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.

B. Fabricate frames, including integral bases, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

C. Fabricate units with closely fitted joints and exposed connections accurately located and secured.

D. Fabricate supports, anchorages, and accessories required for complete assembly.

E. Perform shop welding by AWS-certified procedures and personnel.

3.4 LOUVER PENTHOUSES

A. Manufacturers:

1. Acme Engineering & Mfg. Corp.
2. Aerovent; a Twin City Fan company.
3. Carnes.
4. Greenheck.
5. JencoFan.
6. Loren Cook Company.
7. Penn Ventilation.
8. Ruskin

B. Construction: All-welded assembly with 4-inch (100-mm)-deep louvers, mitered corners, and aluminum sheet roof.

C. Frame and Blade Material and Nominal Thickness: Extruded aluminum, of thickness required to comply with structural performance requirements, but not less than 0.080 inch (2.0 mm) for frames and 0.080 inch (2.0 mm) for blades.

D. Frame and Blade Material and Nominal Thickness: Galvanized-steel sheet, of thickness required to comply with structural performance requirements, but not less than 0.052 inch (1.3 mm) for frames and 0.040 inch (1.0 mm) for blades.

E. Frame and Blade Material and Nominal Thickness: Stainless-steel sheet, of thickness required to comply with structural performance requirements, but not less than 0.050 inch (1.27 mm), with grain running parallel to length of blades and frame members.

F. ALL RELIEF LOUVERS shall have 6" deep drainable blades, all aluminum construction with ultra-low leakage aluminum dampers- counter balance weights that can be set to relieve air pressure differentials less than 0.01" w.g.. Louvers in certain locations require factory hinged sections to allow the dampers to be inspected from the exterior. Refer to schedule on the drawings for additional requirements and finishes. Color selection by architect.

G. Roof Curbs: Galvanized-steel sheet; with mitered and welded corners; 1-1/2-inch- (40-mm-) thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to fit roof opening and ventilator base.

1. Configuration: Self-flashing without a cant strip, with mounting flange.
2. Overall Height: 12 inches above roofing membrane.

H. Bird Screening: Galvanized-steel, 1/2-inch- (12.7-mm-) square mesh, 0.041-inch (1.04-mm) wire.

I. Insect Screening: Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh, 0.012-inch (0.30-mm) wire.

J. Galvanized-Steel Sheet Finish:

1. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas and repair galvanizing according to ASTM A 780. Apply a conversion coating suited to the organic coating to be applied over it.
2. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply an air-dried primer immediately after cleaning and pretreating.
3. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat and an overall minimum dry film thickness of 2 mils (0.05 mm).

a. Color and Gloss: As selected by Architect from manufacturer's full range.

3.5 ROOF HOODS

A. Manufacturers:
1. Aerovent; a Twin City Fan company.
2. Greenheck.
3. JencoFan.
4. Loren Cook Company.
5. Penn Ventilation.

B. Factory or shop fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figures 5-6 and 5-7.

C. Materials: Galvanized-steel sheet, minimum 0.064-inch- (1.62-mm-) thick base and 0.040-inch- (1.0-mm-) thick hood; suitably reinforced.

D. Roof Curbs: Galvanized-steel sheet; with mitered and welded corners; 1-1/2-inch- (40-mm-) thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to fit roof opening and ventilator base.

1. Configuration: Self-flashing without a cant strip, with mounting flange.
2. Overall Height 12 inches (300 mm).

E. Bird Screening: Galvanized-steel, 1/2-inch- (12.7-mm-) square mesh, 0.041-inch (1.04-mm) wire.

F. Insect Screening: Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh, 0.012-inch (0.30-mm) wire.

G. Galvanized-Steel Sheet Finish:

1. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas and repair galvanizing according to ASTM A 780. Apply a conversion coating suited to the organic coating to be applied over it.
2. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply an air-dried primer immediately after cleaning and pretreating.
3. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat and an overall minimum dry film thickness of 2 mils (0.05 mm).

a. Color and Gloss: As selected by Architect from manufacturer's full range.

3.6 GOOSENECKS

A. Factory or shop fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 5-5; with a minimum of 0.052-inch- (1.3-mm-) thick, galvanized-steel sheet.

B. Roof Curbs: Galvanized-steel sheet; with mitered and welded corners; 1-1/2-inch- (40-mm-) thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to fit roof opening and ventilator base.

1. Configuration: Self-flashing without a cant strip, with mounting flange.
2. Overall Height: 16 inches (400 mm)] [18 inches (450 mm).

C. Bird Screening: Galvanized-steel, 1/2-inch- (12.7-mm-) square mesh, 0.041-inch (1.04-mm) wire.

D. Insect Screening: Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh, 0.012-inch (0.30-mm) wire.

E. Galvanized-Steel Sheet Finish:

1. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas and repair galvanizing according to ASTM A 780. Apply a conversion coating suited to the organic coating to be applied over it.
2. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply an air-dried primer immediately after cleaning and pretreating.
3. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat and an overall minimum dry film thickness of 2 mils (0.05 mm).

    a. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 4 - EXECUTION

4.1 INSTALLATION

A. Install intake and relief ventilators level, plumb, and at indicated alignment with adjacent work.

B. Secure intake and relief ventilators to roof curbs with cadmium-plated hardware. Use concealed anchorages where possible. Refer to Division 7 Section "Roof Accessories" for installation of roof curbs.

C. Install goosenecks on curb base where throat size exceeds 9 by 9 inches (230 by 230 mm).

D. Install intake and relief ventilators with clearances for service and maintenance.

E. Install perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

F. Install concealed gaskets, flashings, joint fillers, and insulation as installation progresses. Comply with Division 7 Section "Joint Sealants" for sealants applied during installation.

G. NOTE: ALL OPENINGS IN WALLS FOR LOUVERS SHALL BE COMPLETELY FLASHED WITH MATCHING ALUMINUM TO CONCEAL ALL BUILDING MATERIALS INSIDE/ADACENT TO THE OPENING.

H. Label intake and relief ventilators according to requirements specified in Division 23 Section "Mechanical Identification."

I. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

J. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

4.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories.

4.3 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust counter balance weights for proper building pressurization- coordinate with TAB, Commissioning Agent, and Controls. This shall require multiple iterations. RE-CHECK/Adjust system just prior to Occupancy Turn-Over.

END OF SECTION 23 37 23

SECTION 23 40 00 - MECHANICAL - AIR CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Types of air cleaning equipment specified in this section include the following:

1. Air Filters.
2. Replaceable (throwaway).
3. Filter Holding Systems.
4. Side Servicing Housings.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of air cleaning equipment of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Codes and Standards:

C. UL Compliance: Comply with UL Standards pertaining to safety and performance of air filter units.

D. ASHRAE Compliance: Comply with provisions of ASHRAE Standard 52 for method of testing, and for recording and calculating air flow rates.

1.3 SYSTEM REQUIREMENTS

Verify exact face velocities of air prior to selecting the filters.

1.4 SUBMITTALS:

Product Data: Submit manufacturer's technical product data including, dimensions, weights, required clearances and access, flow capacity including initial and final pressure drop at rated air flow, efficiency and test method, fire classification, and installation instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

Manufacturers: Subject to compliance with requirements, provide air cleaning equipment of one of the following:

A. American Air Filter Co.; An Allis-Chalmers Co.
B. Airguard
C. Continental Filter Corp.
D. Farr Co.
E. Flanders Precisionaire
F. United Air Filter Co.

2.2 AIR FILTERS:

A. Replaceable (Throwaway) Panel Filters: Provide factory fabricated, viscous-coated, pleated type replaceable air filters with holding frames; as indicated, in sizes indicated, UL Class 2 throwaway media material; construct media of interlaced glass fibers, spray with non-flammable adhesive, frame in throwaway fiberboard casings, and sandwich between perforated metal grills. Construct holding frames of 20-gage galvanized steel, capable of holding media and media frame in place, and gasketed to prevent unfiltered air by-passing between media frames and holding members. Provide filters with rated face velocity of 500 fpm, initial resistance of not greater than 0.08" w.g., final rated resistance of 0.15" w.g.

B. Central station AHU's shall have 4" deep pleated filters, MERV 11 rating. VAV boxes shall have 1" deep filters, MERV 8.

C. Install auxiliary filter media on all returns, VAV box inlets, and central station AHU's (Including Admin Penthouse AHU; match existing) during operation prior to final inspection. Replace all filter media monthly or as required. Provide clean set of filters just prior to state final inspection.

2.3 FILTER HOLDING SYSTEMS:

Slide Servicing Housings: Provide factory-assembled slide servicing housings with flanges for insertion into air handling units. Construct of 16-gage galvanized steel. Provide access doors with continuous gasketing on perimeter and positive locking devices. Incorporate positive-sealing gasket material on channels to seal top and bottom of filter cartridge frames to prevent bypass.

END OF SECTION 23 40 00

SECTION 23 51 00 - MECHANICAL - BREECHINGS, CHIMNEYS, AND STACKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY:

This Section specifies double wall metal vents and accessories for gas-fired appliances.

1.3 SUBMITTALS:

Product Data: Submit product data including materials, dimensions, weights, and accessories.

Shop Drawings: Submit shop drawings including required clearances, assembly and installation instructions, and support of components.

Quality Control Submittals:

Certificates: Submit certificates of materials compliance with specified ASTM, UL, and ASHRAE requirements.

1.4 QUALITY ASSURANCE:

Codes and Standards:

NFPA: Comply with NFPA 211 "Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances."

PART 2 - PRODUCTS

2.1 DOUBLE WALL METAL VENTS:

All Steel, Positive Pressure, Double Wall Vents:

Manufacturers: Subject to compliance with requirements, provide all steel, positive pressure double wall vents of one of the following:
Ampco
ProTech Systems, Inc.
Schebler Chimney Systems
Selkirk Metalbestos
Van Packer
Stacks, Inc., Div. of Air Management, Inc.
General Products Co., Inc.
Jeremiahs Exhaust Systems

Construction: 1" minimum air space between walls; inner jacket of Type 304 stainless steel, 0.035" thick; outer jacket of aluminum coated steel, .034 thickness.

Accessories: UL-labeled tees, elbows, increasers, barometric dampers, support assembly, thimbles, and fasteners fabricated of similar materials and designs as vent pipe straight sections.

Install for each boiler or fuel fired appliance. Refer to plans.

For Condensing Boilers, utilize AL 29-4C alloy double wall venting system.
The Jacket (outer tube) shall be manufactured from type 304
stainless steel.
The Air space between the flue gas conduit and jacket shall be one (1) inch.
Install in strict accordance with the mfg. instructions and the boiler mfg. req.. Provide barometric dampers if recommended by the mfg.

2.2 SINGLE WALL VENTS

All fume hood exhaust duct shall be Type 316 stainless steel, 0.035" thick, spiral positive pressure pipe. Provide related weep holes, exit cones, flashing, transitions, and expansion joints, and supports (very tall) as recommended by the manufacturer.

PART 3 – EXECUTION

3.1 INSTALLATION OF DOUBLE WALL CONNECTORS, AND BREECHINGS:

Install all positive pressure, double wall vents in accordance with manufacturer's installation instructions and UL listing. Maintain minimum clearances from combustibles specified in UL listing.

Seal joints between sections of positive pressure vents in accordance with manufacturer's installation instructions, and using only sealants recommended by manufacturer.

Support vents at intervals recommended by the manufacturer to support the weight of the vent and all accessories, without exceeding loading of appliances.

3.2 INSTALLATION OF DAMPERS:

Install thermostatically operated dampers in accordance with manufacturer's instructions. Locate as close to each boiler as possible.

END OF SECTION 23 51 00

SECTION 23 52 16 – CONDENSING BOILERS

PART 5 - PART 1: GENERAL
PART 6 - 1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

This Section includes packaged, factory-fabricated and -assembled, gas-fired, water-tube fire box condensing boilers, trim, and accessories for generating hot water.

1.3 SUBMITTALS

A. Product Data: Include performance data, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: For boilers, boiler trim, and accessories. Include plans, elevations, sections, details, and attachments to other work.

Design calculations and vibration isolation base details, signed and sealed by a qualified professional engineer.

Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails and equipment mounting frames.

Wiring Diagrams: Power, signal, and control wiring.

Manufacturer Seismic Qualification Certification: Submit certification that boiler, accessories, and components will withstand seismic forces defined in Division 15 Section "Mechanical Vibration and Seismic Controls." Include the following:

Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

Source quality-control test reports.

Field quality-control test reports.

Operation and Maintenance Data: For boilers to include in emergency, operation, and maintenance manuals.

Warranty: Special warranty specified in this Section.

Other Informational Submittals:

ASME Stamp Certification and Report: Submit "A," "S," or "PP" stamp certificate of authorization, as required by authorities having jurisdiction, and document hydrostatic testing of piping external to boiler.

QUALITY ASSURANCE

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

ASME Compliance: Fabricate and label boilers to comply with ASME Boiler and Pressure Vessel Code.

ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."

DOE Compliance: Minimum efficiency shall comply with 10 CFR 430, Subpart B, Appendix N, "Uniform Test Method for Measuring the Energy Consumption of Furnaces and Boilers."

UL Compliance: Test boilers for compliance with UL 795, "Commercial-Industrial Gas Heating Equipment." Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

COORDINATION

Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

WARRANTY

Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period.

Warranty Period for Pulse-Combustion Boilers:

Heat Exchanger Damaged by Thermal Shock: 10 years from date of Substantial Completion.
Heat-Exchanger Corrosion: Prorated for five years from date of Substantial Completion.

PART 7 - PRODUCTS

MANUFACTURERS

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on drawings Patterson-Kelly Mach Series Condensing Boiler.

MANUFACTURED UNITS

1.

Available Manufacturers: Subject to compliance with requirements, manufacturers offering boilers that may be incorporated into the Work include, but are not limited to, the following:

Manufacturers: Subject to compliance with requirements, provide boilers by one of the following or approved equal:

Packaged Low Pressure Boiler:
Patterson-Kelley (Basis of Design)
Aerco (Modulux Series)
Lochinvar (Knight Series)
Weil-McClain (Ultra Series)

A. GENERAL

1. Furnish and install factory "packaged" low pressure hot water boilers as manufactured by Patterson-Kelley Co. or as approved and accepted by the engineer. Each factory "packaged" boiler shall be complete with all components, accessories and appurtenances necessary for a complete and operable boiler as hereinafter specified. Each unit shall be furnished factory assembled with required wiring and piping as a self-contained unit. Each unit shall be readily transported and ready for installation.

2. Each factory "packaged" boiler, including pressure vessel, trim, valve trains, burner, control system, and all related components, accessories and appurtenances as herein specified shall all be assembled and furnished by the boiler manufacturer. The boiler manufacturer shall provide unit responsibility for the engineering, coordination, workmanship, performance, warranties, and all field services for each factory "packaged" boiler as specified herein. The boiler manufacturer shall be fully responsible for all components assembled and furnished by him whether or not they are of his own manufacture.

B. PERFORMANCE CRITERIA

1. The minimum capacity of each boiler shall be as scheduled. Boiler inlet water temperature shall be capable of reaching 60°F as a minimum, and, each boiler shall be capable of operating with a minimum outlet water temperature of 68° F. Boilers not capable or rated for this requirement in the standard Manufacturer's literature WILL NOT BE ACCEPTABLE. Each boiler shall be capable of operating continuously at rated capacity while maintaining a CSA certified efficiency of not less than 92 %.

2. Boiler shall comply with ASME Section IV for 50 psig (max 200° F)

3. Fuel shall be natural gas with an assumed higher heating value of 1,030 Btu/Cu Ft and an assumed specific gravity of 0.60 (relative to air). Natural gas shall be supplied at a pressure of no less than 3.5" w.c. to the inlet gas valve. Maximum inlet gas pressure shall not exceed 14" w.c.

4. Ambient air temperature shall be assumed to range from 50°F to 90°F with an average of 70°F.

C. BOILER DESIGN

1. Each hot water boiler shall consist of a horizontal, cast aluminum heat exchanger complete with trim, valve trains, burner, and boiler control system. The boiler manufacturer shall fully coordinate the boiler as to the interaction of its elements with the burner and the boiler control system in order to provide the required capacities, efficiencies, and performance as specified.

2. Each boiler heat exchanger shall be cast aluminum, counter-flow design for maximum heat transfer with the multiple sections arranged in a reverse return configuration to assure balanced flow through each section

3. Contractor must, when filling the system, verify that the pH level is maintained between 6.0 and 8.5.

4. All boiler pressure parts shall be constructed in accordance with the latest revision of the ASME Boiler and Pressure Vessel Code, Section IV, and shall be so stamped.

5. Boiler heat exchanger headers shall be fabricated steel and be completely removable for inspection. Seals shall be EPDM, rated for 400 deg F service. Push nipples or gaskets between the sections are not permitted.

6. Boiler shall be enclosed with a single wall outer casing. It shall be fabricated from a minimum 16 gauge carbon steel. The front and top wall shall be secured in place with ¼ -20 NC bolts (sheet metal screws are not acceptable).The complete outer casing shall be finished, inside and out, with a powder coat finish. The composite structure of the boiler combustion chamber, insulating air gap and outer casing shall be of such thickness and materials to assure an outer casing temperature of not more than 50°F above ambient temperature when the boiler is operated at full rated load.

7. An observation port shall be located on the boiler to allow for observation of the burner flame.

8. A flue gas outlet shall be located on the rear of the boiler. Boiler to be certified for installation with Category IV venting (stack) as defined in NFPA 54 (ANSI Z221), latest edition. Contractor must provide venting (stack) certified for installation on a Category IV appliance.

D. BOILER CONNECTIONS

1. Each boiler shall be provided with all necessary inlet and outlet connections. Boiler connections shall be as follows:
   a. One (1) water supply outlet, 2 ½" Victaulic (fitting to be supplied with boiler, adapter by contractor)
   b. One (1) water return inlet, 2 ½" Victaulic (fitting to be supplied with boiler, adapter by contractor)
   c. One (1) relief valve outlet
   d. One (1) flue gas vent outlet, _____" DIA.
   e. One (1) fuel gas inlet, 1 1/2" size, FPT.

E. BOILER TRIM

1. Each boiler shall be provided with all necessary trim. Boiler trim shall be as follows:
   a. Safety relief valve shall be provided in compliance with the ASME code. Contractor to pipe to acceptable drain.

   b. Water pressure-temperature gauge.

   c. Primary low water flow fuel cutoff (probe type with manual reset).

   d. High limit water temperature controller to stop burner operation at excess water temperature (shall be manual reset).

   e. Operating temperature control to control the sequential operation of the burner.

   f. Separate inlet and outlet water temperature sensors capable of monitoring flow

   g. Exhaust temperature sensor

F. BOILER FUEL BURNING SYSTEM

1. The boiler manufacturer shall furnish each boiler with an integral, power type, straight gas, fully automatic fuel burner. The fuel burner shall be an assembly of gas burner, combustion air blower, valve train, and ignition system. The burner manufacturer shall fully coordinate the burner as to the interaction of its elements with the boiler heat exchanger and the boiler control system in order to provide the required capacities, efficiencies, and performance as specified. Fuel: Natural Gas

2. Each burner shall be provided with an integral gas firing combustion head.

3. Each burner shall provide adequate turbulence and mixing to achieve proper combustion without producing smoke or producing combustibles in the flue gases.

4. Each boiler shall be provided with an integral variable speed power blower to premix combustion air and fuel within the blower. The combustion air blower shall have sufficient capacity at the rated firing rate to provide air for stoichiometric combustion plus the necessary excess air. Static and total pressure capability shall comply with the requirements of the boiler. The blower shall be a maximum of 300 watts and operate at 6000 RPM maximum without undue vibration and noise and shall be designed and constructed for exposure to temperatures normal to its location on the boiler. The operating fan speed will be tachometer sensed and be capable of being displayed at the LED display.

5. Each burner shall of the down-fired type and constructed of steel with a stainless steel inner and stainless steel mesh outer screen.

6. Each boiler shall be provided with a "Full Modulating" firing control system whereby the firing rate is infinitely proportional at any firing rate between 20% and 100% as determined by the pulse width modulation input control signal. Both fuel input and air input must be sequenced in unison to the appropriate firing rate without the use of mechanical linkage.

7. The Manufacturer **MUST** provide control software to the owner for local microprocessor access and control.

8. The Micro Processor shall use a Proportional Integral Algorithm to determine the firing rate.

9. The control must have the following capabilities:

    a. Maintain single set point
    b. Reset the set point based on outdoor air temperature.
    c. Boiler shutdown based on outdoor air temperature
    d. Internal dual set point program with an external switchover. (e.g. - night setback w/external clock, supplied by others)
    e. Alarm relay for any for any manual reset alarm function.
    f. Programmable Low Fire Delay to prevent short cycling based on a time and temperature factor for release to modulation.
    g. LED Display showing current supply and return temperatures, current set points as well as differential set points. It must also display any fault codes whether automatically reset or manually reset.
    h. Local Manual Operation.
    i. Remote Control System (Building Management / Sequencer Control) - The boiler control shall be capable of accepting a 0 -10vdc remote external analog signal to control the firing rate
    j. On board Domestic Hot Water Priority capable of changing from the heating pump to the DHW pump as well as changing the boiler set point from a heating temperature to a higher set point temperature to satisfy the DHW system and then return to the heating mode.
    k. Computer (PC) interface for programming and monitoring all functions

G. MAIN GAS VALVE TRAIN

1. Each boiler shall be provided with an integral main gas valve train. The main gas valve trains shall be factory assembled, piped, and wired. Each gas valve train shall include at least the following:
    a. One (1) manual shutoff valve (gas train inlet connection).
    b. Two (2) safety shutoff valves. Valves equipped with dual solenoids that can independently energized for leak testing.
    c. Air – Gas ratio control (maximum inlet pressure 14" w.c.)
    d. One (1) low gas pressure switch (manual reset).
    e. One (1) high gas pressure switch (manual reset).
    f. Two (2) pressure test ports

H. IGNITION SYSTEM

1. Each boiler shall be equipped for direct spark ignition

I. COMBUSTION AIR CONTROL SYSTEM

1. Each boiler shall be provided with an integral combustion air control system. The combustion air system shall be factory assembled. Each combustion air control system shall include at least the following:

   a. The primary control shall vary the speed of the blower based on load demand. The blower shall apply a varying negative pressure on the gas valve which will open or close to maintain zero pressure at the valve orifice, thereby increasing or decreasing the firing rate. Both the air and gas shall be premixed in the blower.

   b. One (1) low airflow differential pressure switch to insure that combustion air is supplied.

   c. High exhaust back pressure switch

J. BURNER CONTROL SYSTEM

1. The control system shall be supplied with a 24 vac transformer (120 vac, single phase, 60 hertz primary). The 120/1/60 power supply to each boiler shall be protected by a 15 Amp circuit breaker located in the MCC (supplied by contractor).

2. The boiler must include an electric spark ignition system. Main flame shall be monitored and controlled by flame rod (rectification) system.

3. Each boiler shall be provided with all necessary controls, all necessary programming sequences, and all safety interlocks. Each boiler control system shall be properly interlocked with all safeties.

4. Each boiler control system shall provide timed sequence pre-ignition air purge of boiler combustion chamber. The combustion airflow sensor shall monitor and prove the airflow purge.

K. BOILER CONTROL PANEL

1. The boiler manufacturer shall provide each boiler with an integral factory prewired control panel. The control panel shall contain at least the following components, all prewired to a numbered terminal strip:

   a. One (1) burner "on-off" switch.
   b. One (1) electronic combination temperature control, flame safeguard and system control.
   c. Control circuit breaker, 5 amp
   d. All necessary control switches, pushbuttons, relays, timers, terminal strips, etc.
   e. LED Display Panel to adjust set points and control operating parameters. LED display to indicate burner sequence, all service codes (0-65), fan speed, boiler set point, sensor values such as inlet, outlet, flue gas and outdoor air.

L. FACTORY TESTING - HYDROSTATIC

1. Each factory "packaged" boiler shall be hydrostatically tested and bear the ASME "H" stamp.

M. FACTORY TESTING - FIRE TESTING

1. Each factory "packaged" boiler shall be fire tested. The boiler manufacturer shall perform this fire test under simulated operating conditions, with the boiler attached to a working chimney system and with water circulating through the boiler. The manufacturer shall provide a fire test report, including fuel and air settings and combustion test results permanently affixed to the boiler.

N. WARRANTIES

1. The boiler manufacturer shall warrant each boiler, including boiler, trim, boiler control system, and all related components, accessories, and appurtenances against defects in workmanship and material for a period of twelve (12) months from date of final acceptance. Heat exchanger and fuel burner shall be warranted for a period of five (5) years from date of final acceptance. Heat exchanger shall be warranted for a period of ten (10) years against thermal shock.

CONTROLS

Refer to Division 15 Section "Automatic Temperature Controls."

Boiler operating controls shall include the following devices and features:

Control transformer.
Set-Point Adjust: Set points shall be adjustable.
Operating Pressure Control: Factory wired and mounted to cycle burner.
Low-Water Cutoff and Pump Control: Cycle feedwater pump(s) for makeup water control.
Sequence of Operation: Electric, factory-fabricated and field-installed panel to control burner firing rate to reset supply-water temperature to maintain condenser loop temperature.

Include automatic, alternating-firing sequence for multiple boilers to ensure maximum system efficiency throughout the load range and to provide equal runtime for boilers.

Burner Operating Controls: To maintain safe operating conditions, burner safety controls limit burner operation.

High Cutoff: Automatic reset stops burner if operating conditions rise above maximum boiler design temperature.
Low-Water Cutoff Switch: Float and electronic probe shall prevent burner operation on low water. Cutoff switch shall be automatic-reset type.
Blocked Inlet Safety Switch: Manual-reset pressure switch field mounted on boiler combustion-air inlet.
Audible Alarm: Factory mounted on control panel with silence switch; shall sound alarm for above conditions.

Building Management System Interface: Factory install hardware and software to enable building management system to monitor, control, and display boiler status and alarms.

Hardwired Points:

Monitoring: On/off status, common trouble alarm.
Control: On/off operation, hot water supply temperature set-point adjustment.

A communication interface with building management system shall enable building management system operator to remotely control and monitor the boiler from an operator workstation. Control features available, and monitoring points displayed, locally at boiler control panel shall be available through building management system.

ELECTRICAL POWER

Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 16 Sections.

Single-Point Field Power Connection: Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.

House in NEMA 250, Type 1 enclosure.
Wiring shall be numbered and color-coded to match wiring diagram.
Install factory wiring outside of an enclosure in a metal raceway.
Field power interface shall be to fused disconnect switch or circuit breaker.
Provide branch power circuit to each motor and to controls with a disconnect switch or circuit breaker.
Provide each motor with overcurrent protection.

VENTING KITS

Kit: Complete system, ASTM A 959, Type AL29-4C stainless steel, pipe, vent terminal, thimble, indoor plate, vent adapter, condensate trap and dilution tank, and sealant.

Combustion-Air Intake: Combustion air will be provided to the space through louvers mounted in the exterior walls.

SOURCE QUALITY CONTROL

Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test.

Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.

Allow Owner access to source quality-control testing of boilers. Notify Architect 14 days in advance of testing.

PART 8 - EXECUTION

EXAMINATION

Before boiler installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting boiler performance, maintenance, and operations.

Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

Examine mechanical spaces for suitable conditions where boilers will be installed.

Proceed with installation only after unsatisfactory conditions have been corrected.

BOILER INSTALLATION

Install boilers level on concrete base.

Vibration Isolation: Elastomeric isolation pads mounts with a minimum static deflection of 0.25 inch (6.35 mm).

Install gas-fired boilers according to NFPA 54.

Assemble and install boiler trim.

Install electrical devices furnished with boiler but not specified to be factory mounted.

Install control wiring to field-mounted electrical devices.

Install condensate neutralization tank for each boiler. Extend drain from each neutralization tank to nearest floor drain in boiler room.

CONNECTIONS

Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

Install piping adjacent to boiler to allow service and maintenance.

Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.

Connect piping to boilers, except safety relief valve connections, with flexible connectors of materials suitable for service.

Connect gas piping to boiler gas-train inlet with union. Piping shall be at least full size of gas train connection. Provide a reducer if required.

Connect hot-water piping to supply- and return-boiler tappings with shutoff valve and union or flange at each connection.

Install piping from safety relief valves to nearest floor drain.

Install piping from safety valves to drip-pan elbow and to nearest floor drain.

Boiler Venting:

Install flue venting kit. Combustion air will be provided from space and louvers to the outside. Connect full size to boiler connections.

FIELD QUALITY CONTROL

Perform tests and inspections and prepare test reports.

Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

Tests and Inspections:

Perform installation and startup checks according to manufacturer's written instructions.
Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level and water temperature.
Set field-adjustable switches and circuit-breaker trip ranges as indicated.
Remove and replace malfunctioning units and retest as specified above.

Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

Performance Tests:

Engage a factory-authorized service representative to inspect component assemblies and equipment installations, including connections, and to conduct performance testing.
Boilers shall comply with performance requirements indicated, as determined by field performance tests. Adjust, modify, or replace equipment to comply.
Perform field performance tests to determine capacity and efficiency of boilers.
Test for full capacity.
Test for boiler efficiency at low fire and 20 percent of full capacity. Determine efficiency at each test point.
Repeat tests until results comply with requirements indicated.
Provide analysis equipment required to determine performance.
Provide temporary equipment and system modifications necessary to dissipate the heat produced during tests if building systems are not adequate.
Notify Architect in advance of test dates.
Document test results in a report and submit to Architect.
Check water quality the first 3 months, at 6 months and at 1 year mark on each installation. Water conditions, including PH levels shall be documented and submitted to owner and engineer at each interval.

DEMONSTRATION

Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain boilers. Video training sessions.

END OF SECTION 23 52 16

SECTION 23 64 00 - AIR COOLED CHILLERS - MECHANICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and DivisionÄ1 Specification sections, apply to work of this section.

1.2 SUMMARY: Provide an air cooled chiller utilizing rotary screw style compressor. See schedule on plans for size and capacity.

1.3 QUALITY ASSURANCE:

A. Installer's Qualifications: Firm with at least 5 years of successful installation experience with projects utilizing air cooled chiller similar to unit required for this project.

B. ARI Compliance: Test and rate chiller in accordance with ARI Std 590.

C. ASHRAE Compliance: Construct and install chiller in accordance with ASHRAE Std 15, "Safety Code for Mechanical Refrigeration". Provide Energy Efficiency Ratio (EER) for chillers not less than prescribed by ASHRAE Std 90A, "Energy Conservation in New Building Design".

D. ASME Compliance: Construct and test air-cooled liquid chiller in accordance with ASME Boiler and Pressure Vessel Code, Section 8.

1.4 SUBMITTALS:

Product Data: Submit manufacturer's technical product data, including rated capacities for chillers indicated, weights (shipping, installed, and operating), furnished specialties and accessories; and rigging, installation, and start-up instructions.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Handle chiller and components properly to prevent damage, breaking, denting and scoring. Do not install damaged chiller or components; replace with new. Comply with manufacturer's rigging and installation instructions for unloading rotary screw chillers, and transporting them to final location.

B. Store chiller and components in clean dry space. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

PART 2 - PRODUCTS

2.1 OUTDOOR AIR-COOLED CHILLER:

A. General: Provide factory-assembled and tested outdoor air-cooled liquid chiller as indicated, consisting of compressors, evaporator, condensers, thermal expansion valves, and control panels. Provide capacity and electrical characteristics as scheduled.

B. Refrigerant: Provide full operating charge of refrigerant and oil (R-410a).

C. Housing: Provide manufacturer's standard equipment housing construction, corrosion protection coating, and exterior finish. Provide hail guards, side panels, removable panels and/or access doors for inspection and access to internal parts and components.

D. Evaporator: Provide tube-in-shell design with seamless copper tubes roller expanded into tube sheets. Design, test, and stamp for refrigerant side working pressure of 225 PSIG and water side working pressure of 300 PSIG, in accordance with ASME Pressure Vessel Code. Provide one water pass with series of internal baffles. Insulate with 3/4" flexible unicellular insulation with maximum K valve of 0.28. Provide water drain connection and bulb wells for temperature controller and low-temperature cutout.

E. Heater Tapes: Provide electrical resistance heater tape on evaporator to protect against freezing at 0 deg.F ambient at no-flow condition. Provide minimum 5.0 watts/foot heat tape, thermostatically controlled.

F. Condenser: Construct coils with configurated aluminum fins mechanically bonded to seamless copper tubing. Provide integral subcooling circuit. Leak test coils with air under water at 425 PSIG air pressure. Provide protective grilles over exposed coil faces.

G. Condenser Fans: Provide propeller fans, direct driven, draw- through design, statically and dynamically balanced. Provide permanently lubricated ball-bearing motors with overload protection. Provide protective grille over air discharge.

H. Ambient Control: Provide head pressure control, designed to operate at temperatures down to 25 deg.F.

I. Compressors: Provide two rotary screw or scroll compressors with two refrigeration circuits.

J. Lubrication: Provide oil pump, oil level sight glass, and oil charging valve.

K. Capacity Modulation: Provide control by means of starting-stopping compressors from return water temperature.

L. Refrigerant Circuit: Provide for each refrigerant circuit the following:
   a. Liquid line solenoid valve.
   b. Filter dryer.
   c. Liquid line sight glass.
   d. Thermal expansion valve.
   e. Insulated suction line.
   f. Suction and discharge valves.

M. Control Panels: Provide weathertight controls panels, factory-wired for external connection only. Provide the following controls:
   a. Power controls for starter.
   b. Control power transformer for 115V control voltage.
   c. Microcomputer controls.
   d. Compressor starter relay.
   e. Reset relay.
   f. Nonrecycling compressor overload relay.
   g. High-pressure cutout.
   h. Low-pressure cutout.
   i. Oil pressure cutout.
   j. Low-temperature cutout.
   k. Chilled water temperature controller.
   l. Low ambient control.
   m. Load signal for DDC (4-20 or 0-10).

N. Manufacturers: Subject to compliance with requirements, provide outdoor air-cooled chiller as manufactured by one of the following companies or approved equal:

a. Carrier
b. Daikin Applied
c. Trane Company

PART 3 - EXECUTION

3.1 INSTALLATION OF CHILLER:

A. General: Install chiller in accordance with manufacturer's written instructions. Install units plumb and level, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.

B. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer. **MC shall coordinate electrical requirements with the EC prior to the release of the electrical switchgear and panels. Failure to coordinate will result in the MC paying for all electrical costs associated with the breaker changes.** If the equipment mfg. requires different electrical requirements, the MC shall be responsible for any changes. **ALSO** include maximum wire type, size, & number of conductors allowed by the chiller lugs. Coordinate!

C. Control: Furnish field-installed automatic temperature control requirements to Control Installer.

D. Provide services of manufacturer's factory-trained service representative to start-up chiller. Include in start-up procedures, testing controls, demonstration of compliance with requirements, and replacement of damaged or malfunctioning controls and equipment.

E. Mechanical Contractor shall provide concrete pad- refer to detail on drawing. Provide thermostatically controlled heat trace, insulation, aluminum jacket on all piping above the frost line. DDC shall monitor heat trace operation via CT- coordinate with DDC vendor.

F. For Roof Mounted Installations, contractor shall provide restrained spring vibration isolation rails.

G. Sound Attenuation Package: Provide ultra-quiet fans, compressor blankets, flexible pipe connections, spring isolators, etc. as required to provide quiet operation to all building occupants.

3.2 TRAINING OF OWNER'S PERSONNEL:

A. Provide services of manufacturer's technical representative for one 8-hour day to instruct Owner's personnel in operation and maintenance of chiller.

B. Schedule training with Owner, provide at least 7-day notice to Contractor and Engineer of training date.

3.3 WARRANTY:

A. Chiller(s) shall have complete 12 month (from date of final acceptance) warranty for all parts, labor, and refrigerant. ALSO include all factory recommended service work during this warranty period. As a minimum, chiller mfg. service technician shall visit the equipment once per quarter (4 trips total) for the purpose of inspecting, cleaning the coils and other components as needed, documenting unit conditions and performance, etc.

B. Chiller shall ALSO have a five (5) year compressor parts and labor warranty (non-prorated) in the Base Bid.

C. Alternate Bid: Provide full five (5) year complete unit warranty (all components, refrigerant, etc.)- both parts and labor PLUS the factory recommended maintenance during this period.

END OF SECTION 23 64 00

SECTION 23 73 00 - CENTRAL-STATION AIR-HANDLING UNITS - MECHANICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

This Section includes central-station air-handling unit (designated on plans as AHU) with coils for indoor installation. Consult schedule on plans for size and capacities.

1.3 SUBMITTALS

A. Product data for each central-station air-handling unit indicated, including the following:

a. Certified fan performance curves with system operating conditions indicated.

b. Certified fan sound power ratings.

c. Certified coil performance ratings with system operating conditions indicated.

d. Motor ratings and electrical characteristics plus motor and fan accessories.

e. Materials gages and finishes.

f. Dampers, including housings, linkages, and operators.

1.4 QUALITY ASSURANCE

NFPA Compliance: Central-station air-handling units and components shall be designed, fabricated, and installed in compliance with NFPA Standard 90A "Standard for the Installation of Air Conditioning and Ventilating Systems."

ARI Certification: Central-station air-handling units and their components shall be factory tested in accordance with the applicable portions of ARI 430 - Standard for Central-Station Air-Handling Units and shall be listed and bear the label of the Air-Conditioning and Refrigeration Institute.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:

A. Carrier Air Conditioning
B. The Trane Co.
C. JCI
D. VTI

2.2 UNITS

A. General Description: consisting of fans, motor and drive assembly, coils, damper, plenums, filters, drip pans, and mixing dampers.

B. Types: Central-station air-handling units included in this project are of the following types:

1. Draw-through.
2. Air-handling split system

2.3 CABINET

A. Materials: Provide double wall construction- galvanized sheet metal with urethane foam sandwiched between the panels.

B. Insulation: Comply with NFPA Standard 90A "Standard for the Installation of Air Conditioning and Ventilating Systems," for insulation.

C. Type: Urethane foam

D. Location and Application: Inside wall panels.

E. Access Panels and Doors: Same materials and finishes as cabinet and complete with hinges, latches, handles, and gaskets. Compartments for all sections except electrical shall be accessed without use of a tool.

F. Fan section shall have inspection and access panels and doors sized and located to allow periodic maintenance and inspections.

G. Double-Wall Drain Pans: Formed sections of stainless steel. Fabricate pans in sizes and shapes to collect condensate from cooling coils when units are operating at the maximum cataloged face velocity across the cooling coil. Fill space between double-wall construction with foam insulation and seal moisture tight. IAQ style drain pan.

H. Auxiliary condensate systems shall be provided in accordance with North Carolina Mechanical Code. Provide aux. drain pan with float switch. Condensate drain pans shall be insulated and have a minimum of 2% slope in two planes to the condensate drain connection.

I. Pan top surface coating: Elastomeric compound.

2.4 FANS SECTION-

A. Testing Requirements: The following factory tests are required:

B. General: Sound power level ratings shall comply with latest AMCA Standard. Fans shall be licensed to bear the AMCA Certified Sound Ratings Seal.

C. Fan Section Construction: Fan section shall be equipped with a formed steel channel base for integral mounting of fan, motor, and casing panels. The fan scroll, wheel, shaft, bearings, and motor shall be mounted on a structural steel frame with frame mounted on base with vibration isolators. Provide perforated inner wall of this section to aid in sound attenuation.

D. Fans and Shafts: Statically and dynamically balanced and designed for continuous operation at the maximum rated fan speed and motor horsepower. Fan shall operate between 0 and 100% load with Solid State variable speed drive. Fan wheel shall be double-width, double-inlet type with forward-curved blades. Forward-curved blade wheels shall be galvanized steel or bonderized steel painted with baked-enamel finish. Fan shaft shall be solid steel, turned, ground, and polished. Fan wheels shall be keyed to the shaft.

E. Shaft Bearings: Grease-lubricated ball bearings selected for 200,000 hours' average life, with grease fittings extended to an accessible location outside the fan section.

F. Fan Drives: Designed for a 1.4 service factor and factory mounted with final alignment and belt adjustment made after installation.

G. ALL fans shall be direct drive. Provide quantity as per schedule on drawings. Fan motors shall not operate greater than 75 hz to meet designated flows.

H. Motors mounted on the outside of the fan cabinet shall have steel belt guards.

2.5 MOTORS

A. Temperature Rating: 50 deg C maximum temperature rise at 40 deg C ambient for continuous duty at full load (Class A Insulation).

B. Service Factor: 1.15 for polyphase motors and 1.35 for single-phase motors. Fan motors shall not operate greater than 75 hz to meet designated flows.

C. Motor Construction: NEMA Standard MG 1, PREMIUM EFFICIENCY, inverter duty, continuous duty, Design B. Motor shall be 100% variable speed with matching controller. Refer to section 230515 Variable Frequency Drives.

D. Bases: Adjustable.

E. Bearings: The following features are required:

F. Ball or roller bearings with inner and outer shaft seals.
G. Grease lubricated.

H. Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.

I. Enclosure Type: The following features are required:

J. Open drip-proof motors where satisfactorily housed or remotely located during operation.

K. Guarded drip-proof motors where exposed to contact by employees or building occupants.

L. Overload protection: Built-in, automatic reset, thermal overload protection. ALL ELECTRICAL PROTECTION SHALL BE PROVIDED BY THE MFG BEYOND THE SINGLE POINT POWER SHOWN ON THE DRAWINGS. This shall include all fuses, breakers, etc. required to properly protect the unit.

M. Noise rating: Quiet.

N. Efficiency: "Energy Efficient" motors shall have a minimum efficiency as scheduled in accordance with IEEE Standard 112, test method B and the NC Building Code, Energy Code. If efficiency not specified, motors shall have an efficiency meeting the above requirements.

O. Provide Nema Premium efficiency for single speed, polyphase, 1-500 horsepower, 2, 4 and 6 pole, squirrel cage induction motors, NEMA design A or B, continuous rated.

P. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, and special features.

2.6 COILS

A. Testing Requirements: The following factory tests are required:

a. Coil Performance Tests: Cooling and heating coils shall be factory tested for rating in accordance with ARI 410 - Standard for Forced-Circulation Air- Cooling and Air-Heating Coils.

B. Coil Sections: Common or individual insulated, galvanized steel casings for heating and cooling coils. Coil section shall be designed and constructed to facilitate removal of coil for maintenance and replacement and to assure full air flow through coils.

C. Coils, General: Drainable, rigidly supported across the full face of the coil, and pitched to allow drainage. DX coils in AHU shall be split into multiple circuits to allow unit to modulate and match loads. Chilled water coils do not require multiple circuits unless height of coil requires multiple levels. Consult schedule on drawings.

D. Fins: Aluminum or copper, constructed from flat plate with belled collars for tubes. Fins shall be bonded to tubes by mechanically expanding copper tubes.

E. Tubes: Seamless copper.

F. Coil Casing: Galvanized steel.

G. Headers for Water Coils: Steel or cast iron, with connections for drain valve and air vent and threaded piping connections.

H. Face velocities shall not exceed the following limits: 500 FPM cooling coil face velocity; 500 FPM filter face velocity; 600 FPM outdoor air intake velocity; 700 FPM heating coil face velocity. Modify the air handling units as necessary to minimize face velocity. Verify that cooling coil, outdoor air intake and heating coil face velocities meet the above velocity limitations. Provide manufacturer guideline/recommendations if the mfg. has coils that are specifically designed for different face velocities- submit to engineer during bid period for consideration.

I. Provide manufacturer guideline/design and recommendations for multiple coils that are specifically designed for custom built applications; submit to engineer during bid period for consideration.

2.7 DAMPERS

A. General: Leakage rate when tested in accordance with AMCA Standard 500 - Test Method for Louvers, Dampers and Shutters, shall not exceed 2 percent of air quantity calculated at 2,000 fpm face velocity through damper and 4.0 inches w.g. pressure differential. Refer to 230900-2 for motorized control dampers. Dampers shall have spring return.

B. Combination Filter/Mixing Box: Parallel-blade dampers in a reinforced, galvanized steel cabinet. Damper blades shall be galvanized steel mechanically fastened to steel operating rod. Connect operating rods for each set of dampers together with a common linkage and interconnect linkages so dampers operate simultaneously and in the opposite direction. Cabinet shall have support members to hold permanent filter frame. Mixing boxes shall have hinged access panels or doors to allow removal of filters for both sides of unit without use of any tools.

2.8 FILTERS SECTION

A. General: Filters shall comply with NFPA Standard 90A "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Filter Section: Cabinet material and finish shall match the air-handling unit cabinet, with filter media holding frames arranged for angular orientation. Section shall have access doors on both sides of the unit. Consult Section 23 40 00 for type of filter media.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Provide scaled drawing of each mechanical room (1/2 scale) of both plan and elevation(s) for approval prior to laying out pads.

B. Install central-station air-handling units level and plumb, in accordance with manufacturer's written instructions.

C. Support floor-mounted units on concrete equipment bases using housed spring isolators. Secure units to anchor bolts installed in concrete equipment base.

D. Suspended Units: Suspend units from structural steel support frame using threaded steel rods and vibration isolation springs.

E. Arrange installation of units to provide access space around air-handling units for service and maintenance.

F. Unit must be designed for stable operation at both the initial load (cfm) and the future load.

3.2 EQUIPMENT BASES

A. Construct concrete equipment pads as follows:

a. Coordinate size of equipment bases with actual unit sizes provided. Construct base 4 inches larger in both directions than the overall dimensions of the supported unit. Height of pad shall be 4".

CONNECTIONS

ADJUSTING, CLEANING, AND PROTECTING

A. Adjust water coil flow, with control valves to full coil flow, to indicated gpm.

B. Adjust damper linkages for proper damper operation.

C. Clean unit cabinet interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheel, fan cabinet, and coils entering air face.

D. Provide one (1) spare set of belts and filters.

E. Contractor shall include in his bid price to change the filters four times during construction in case they are operated prior to turning the building over to the Owner. Any additional required changes shall be reimbursed by the GC if the units are running at their request. Also include wiping down the inside of the unit and washing the hot and chilled water coils.

END OF SECTION 23 73 00

SECTION 237500 – OUTSIDE AIR UNITS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Packaged Cooling
2. Packaged Heating
3. Packaged Controls

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include all rated capacities at scheduled design conditions, operating characteristics, general product features, options and accessories, controls, pre-programmed controls sequences, all end devices, and unit warranties provided.

B. Shop Drawings: For equipment, include plans, elevations, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, corner weights, required clearances, components, and location and size of each field connection.

C. Factory start-up, inspection, and check-out reports to be provided to engineer for review prior to final equipment acceptance, startup, or commissioning. See section 2.2 for more information.

D. Operation and Maintenance Data to be provided with unit at shipment including Mechanical O&M and Controls Instructions and O&M.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Applicable requirements in ASHRAE 62.1-2013, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Startup."
2. Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2013.
3. ASHRAE 90.1 and EER requirements

C. ANSI Z83.8 and CSA 2.6 standards for gas fired equipment

D. UL Compliance:

1. Unit shall be ETL listed per UL standard 1995 and CSA standard C22.2 #236

1.5 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with equipment provided.

B. Coordinate sizes and locations of concrete bases with equipment provided.

C. Coordinate locations of connecting utilities including: water, gas, electric, controls, and condensate with equipment provided.

1.6 DELIVERY AND HANDLING

A. Unit shall be shipped with door handles locked shut with door handle set screws and outside air hood closed to prevent damage during transport and temporary storage.

B. Follow IOM instructions for rigging and unloading the unit at its final location.

C. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the IOM.

1.7 WARRANTY

A. Unit Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment which fail in materials or workmanship within specified warranty period. Warranty period shall begin at startup, or six months after shipment, whichever occurs first:

1. Parts Warranty Period for Units: One (1) year.
2. Parts Warranty Period for Compressors: Five (5) years.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed.
1. Filters: One set of each type of filter specified.

PART 2 – PRODUCTS

2.1 PACKAGED ENERGY RECOVERY UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Valent, Annex Air, Venmar
2. No substitutions

B. Unit Construction:

1. Base: Manufacturer's standard base shall be constructed of minimum 10 gage galvanized steel with 16 gage integral floor pan. Floor pan shall be insulated with minimum 1/4" closed cell neoprene liner. All floor seams shall have a raised rib joint. Penetrations through the floor shall have a minimum 3/8" raised rib around each opening. Base shall have a minimum 4" overhang over the top of a roof curb to prevent water infiltration.
2. Panels: Manufacturer's standard casing shall be constructed of minimum 2-inch, foam-injected, double-wall panels.

a. Individual panels shall be constructed so that there is no metal-to-metal contact between the interior and exterior sheet metal of each panel.
b. Interior side of panel shall be 22 gage G-90 galvanized steel. Exterior side of panel shall be 22 gage pre-painted steel rated for 1000 hours of salt spray exposure in accordance with ASTM B117 and ASTM D1654.
c. Insulation shall be 2 lb/ft^3 injected foam insulation with a minimum R-value of 12. Foam sheet or fiberglass insulation are not acceptable due to reduced durability of panel and increased chance for rust forming between the panels. Insulation water

absorption must be no more than 0.038 lb/ft per ASTM D2842 and show "no growth" per ASTM G21 biocide testing. Interior sheet metal shall encase insulation so that it is not exposed to the airstream.

3. Access doors shall be provided for access to all internal components requiring regular maintenance or inspection. Access door construction and materials shall be identical to unit casing. Access doors shall have galvanized hinges and a minimum of two quarter-turn compression latches with adjustable catches. Access doors shall be sealed with a full-perimeter D-shaped gasket constructed of EPDM sponge rubber.
4. Roof shall be pitched away from access doors and include a minimum ½" overhang around the perimeter of the unit.
5. Outdoor Air Inlet: Outdoor units shall be provided with a factory provided, field-assembled weather hood with ½" aluminum washable filters on the outdoor air inlet. Indoor units shall be provided with duct connections at the outdoor air inlet.
6. Unit return shall be horizontal back and without the need for a plenum curb.

   a. Plenum curbs are not allowed.

7. Unit discharge shall be horizontal flow without the need for a plenum curb.

   a. Plenum curbs are not allowed.

8. Unit shall include lifting eyes on top of unit for use during rigging.
9. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
10. Motorized dampers – Outside Air and Return Air

    a. Frame shall be constructed of a 16 gage galvanized steel hat-channel.
    b. Blades shall be constructed of 16 gage galvanized steel strengthened by three longitudinal 1 inch deep "vee" grooves.
    c. Blades shall be symmetrical relative to its axle pivot point.
    d. Axle bearings shall be synthetic sleeve-type and rotate inside extruded holes in the damper frame.
    e. Blade seals shall be extruded vinyl permanently bonded to the appropriate blade edges.
    f. Frame shall include flexible stainless steel compression-type jamb seals.
    g. Modulating spring-return actuators shall be provided by the factory, installed on the damper, and wired to the control center. Each damper shall have a dedicated actuator. Single actuators with gear trains are not acceptable.
    h. Damper leakage shall be no more than 3 cfm/sq.ft. at 1 in.wg static pressure.

11. Exhaust: Gravity backdraft damper with internal bird screen. Indoor units shall have duct flanges for connection to exhaust ductwork.

C. DX Cooling Coil:

1. Coil shall be rated in accordance to AHRI standards, designed to withstand 250 psig working pressure at 300 degrees F, and pressure tested to 600 psig.
2. Coil shall be a minimum of 6 rows deep with maximum fin density of 10 fins per inch.
3. Refrigeration systems with more than one circuit shall have interlaced evaporator coils.
4. Coil casing shall be constructed of 304 stainless steel.
5. Coil tubes shall be constructed of 1/2" diameter, 0.016" thick seamless copper tubing.
6. Coil fins shall be constructed of 0.0060" thick aluminum.
7. Coil shall be hydrogen or helium leak tested.
8. Drain pan

   a. Drain pan shall be constructed of a minimum of 18 gage 201 stainless steel.
   b. Drain pan shall be double-sloped to ensure condensate removal from unit.

c. Drain pan shall extend a minimum of 8" past the evaporator coil to ensure condensate retention.

D. Refrigeration – Air Cooled DX:

1. Unit shall be provided with factory piped, charged, and tested packaged air-cooled direct expansion refrigeration system.
2. Unit shall be factory charged with R-410A refrigerant.
3. Refrigeration systems shall be equipped with two stages of capacity control, each stage on an independent refrigerant circuit.
4. Refrigeration systems 30 nominal tons and above shall be equipped with four stages of capacity control, two stages per independent circuit.
5. Refrigeration system shall be provided with thermal expansion valve (TXV) (Digital Scroll™ compressor) incorporating adjustable superheat.

E. Compressors:

1. Compressors shall be hermetic scroll type and include the following items:

   a. Suction and discharge isolation valves.
   b. Reverse rotation protection.
   c. Oil level adjustment.
   d. Oil filter.
   e. Filter drier
   f. Short cycling control.
   g. High and low pressure limits.
   h. Crankcase heaters.
   i. Thermal overload.
2. Compressors shall be installed in a separate compartment which can be accessed without affecting unit operation, above the unit floor, and isolated from the surrounding environment by double wall foam injected panels and access doors.
3. Compressors shall be installed using manufacturer's recommended rubber vibration isolators.
4. Capacity control shall be provided through the use of a single Digital Scroll™. Additional compressors, if required, shall be fixed stage scroll compressors.

F. Hot Gas Reheat:

1. Hot-gas reheat coil shall be separated from the evaporator coil by a minimum of 6" in the direction of airflow to prevent the re-evaporation of condensate, provide room for coil cleaning, and allow control system to monitor evaporator coil leaving dew point temperature.
2. Coil shall be rated in accordance to AHRI standards, designed to withstand 250 psig working pressure at 300 degrees F, and pressure tested to 600 psig.
3. Coil casing shall be constructed of 16 gage galvanized steel
4. Coil tubes shall be constructed of 5/16" diameter, 0.012" thick seamless copper tubing.
5. Coil fins shall be constructed of 0.0060" thick aluminum fins.
6. Hot-gas reheat shall be controlled through a factory-supplied and controlled modulating 3-way valve.
7. Coil shall be hydrogen or helium leak tested.

G. Air Cooled Condenser:

1. Air cooled condenser coil shall be unit mounted.
2. Provide condenser coils with galvanized casing, seamless copper tubes, and aluminum fins.

3. Coil shall be rated in accordance to AHRI standards, designed to withstand 250 psig working pressure at 300 degrees F, and pressure tested to 600 psig.
4. Coil casing shall be constructed of 16 gage galvanized steel.
5. Coil tubes shall be constructed of 5/16" diameter, 0.012" thick seamless copper tubing.
6. Coil fins shall be constructed of 0.0060" thick aluminum fins.
7. Coil shall be hydrogen or helium leak tested.
8. Condenser coils shall be mounted at a minimum 30 degree angle from vertical to help prevent hail damage.
9. Condenser coils shall include factory provided and installed condenser coil guards.

H. Condensing Fans – Low ambient:

1. Condensing section shall be equipped with 1140 rpm direct-drive condensing fans.
2. Condensing fan assembly shall be statically and dynamically balanced in accordance with AMCA Standard 204-05.
3. Condensing fan assembly shall consist of aluminum-bladed propeller fan wheel, formed-channel base, formed inlet venturi, and coated steel basket guard on the discharge.
4. A factory-supplied variable frequency drive shall be provided to modulate a single condensing fan to maintain refrigerant pressure in the condensing section.
5. All additional condensing fans shall enable/disable to maintain refrigerant pressure in the condensing section.

I. Direct Drive Supply and Exhaust Airflow Blowers:

1. Fan assemblies shall be direct-drive without the use of belts or adjustable sheaves.
2. A variable frequency drive (VFD) shall be provided for each fan section. VFD shall be mounted, wired, and programmed by the equipment manufacturer. VFD shall be located in an enclosed compartment outside of the supply or exhaust air stream.
3. Fan wheels shall be constructed of welded aluminum with airfoil blades.
4. Fan wheel shall be tested in accordance to AMCA 210. Fan speed shall not exceed 2400 RPM.
5. Fans may be full width or partial width. Fans modified to partial width through the use of banding or other blade reduction method are not acceptable.
6. Fans shall be mounted on minimum 1" tall neoprene isolators.
7. Fan motor shall be VFD rated, ODP type, EPACT compliant, and shall be of premium efficiency (PE).

J. Gas Heating:

1. Unit shall be provided with AGA-certified, induced-draft, 10:1 turndown indirect gas furnace.
2. Furnace assembly shall include the following items:

   a. Electronic modulating gas valve.
   b. Two-speed combustion fan.
   c. 409 stainless steel heat exchanger.

K. Filters:

1. Outdoor air filters

   a. Outdoor air filter rack shall accommodate factory-provided 2" MERV8 filters.
   b. Filter sections shall be accessible through a 2" foam-injected, double-wall, hinged access door with quarter-turn latches.

c. Extra set of filters shall be provided.

2. Return air filters

a. Return air filter rack shall accommodate factory-provided 2" MERV8 filters.
b. Filter sections shall be accessible through a 2" thick, foam-injected, double-wall, hinged access door with quarter-turn latches.

3. Supply air filters

a. Supply air filter rack shall accommodate factory-provided 2" MERV 8 filters.
b. Filter sections shall be accessible through a 2" thick, foam-injected, double-wall, hinged access door with quarter-turn latches.
c. Filter section shall include magnehelic gauge.

L. Electrical:

1. Unit shall be constructed with an integral electrical and control center isolated from supply airflow, exhaust airflow, compressors, and heating elements. The control center shall control all aspects of the unit operation. VFDs with overload protection shall be provided for each fan bank.
2. Units shall be wired according to NEC and listed per ETL. ETL listing shall cover all components of the ventilator and not be limited to the control panel. All major electrical components shall be UL or ETL listed.
3. Unit shall have a single point of connection with integral unit mounted disconnect. Panel shall have an SCCR rating of 65 kV.
4. Units shall be factory wired with a single point power connection.
5. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more than 7% out of balance on voltage, the voltage is more than 7% under design voltage, or on phase reversal.
6. The following items shall be provided and wired within the control center by the factory:
   a. Non-fused disconnect.
   b. Sub-circuit fusing.
   c. Low voltage transformers.
   d. Controls as specified in this section.
   e. Control circuit fusing.
   f. Terminal block.
   g. Supply and Exhaust Fan motor Variable Frequency Drives (VFDs).
7. Electrical panel must house all high voltage components such as terminal blocks, variable frequency drives, and fuse blocks.
8. All electrical power and controls wiring shall run in chase located between unit ceiling and roof to minimize interior wall penetrations and allow for ease of access.
   a. Control panel shall include a factory supplied and mounted 115V GFCI convenience outlet receptacle with a 12A circuit breaker. Outlet shall be powered by others in the field.

M. Controls:

1. Units shall include factory supplied, mounted, wired, and tested stand-alone microprocessor controls.
2. Microprocessor controller shall be factory-programmed for discharge air control and use an internal 7-day time clock.
3. Microprocessor controller shall include local liquid crystal display (LCD) for user interface. Microprocessor controller remote LCD shall be mounted in a weather-proof enclosure and accessible without exposing the operator to high voltage wiring or having to turn off or circumvent the main disconnect.

4. Microprocessor controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.
5. The following sensors shall be factory supplied, mounted, and wired inside the unit:

   a. Outdoor air humidity sensor.
   b. Outdoor air temperature sensor.
   c. Evaporator coil leaving air temperature sensor.
   d. Supply air filter pressure magnehelic gauge.
6. The following devices shall be factory-supplied for field installation and wiring:

   a. Supply air temp temperature sensor.
7. Microprocessor controller shall include BACnet MSTP communications for building management system interface.
8. Microprocessor controller shall include a Web UI interface for remote web-based access of all unit digital and analog inputs and outputs. Web UI shall include unit scheduling, point trending capabilities, and an alarm history.

2.2 FACTORY VERIFICATION TESTING

A. Unit shall be thoroughly run tested prior to shipment from the factory.

B. Factory run test report shall be provided at the request of the engineer, contractor, or owner.

C. Testing Procedures

1. Unit shall be subjected to and pass a dielectric (hipot) test.
2. All motorized dampers shall be cycled one full stroke while installed in the unit using the factory-provided motorized actuators.
3. Supply fan

   a. Visually inspect ramp-up, ramp-down, and rotation direction of fan when enabled.
   b. Verify fan pressure proving switch operation.
   c. Measure and record current draw through supply fan motor(s).

4. Exhaust fan

   a. Visually inspect ramp-up, ramp-down, and rotation direction of fan when enabled.
   b. Verify fan pressure proving switch operation.
   c. Measure and record current draw through exhaust fan motor(s).

5. Indirect gas furnace

   a. Indirect gas furnace shall be run tested while installed inside unit with 8.5 in.wg of natural gas.
   b. Measure and record leaving air temperature and manifold pressure at minimum fire.
   c. Measure and record leaving air temperature and manifold pressure and maximum fire.

6. Condensing fans

   a. Ensure fans rotate freely without obstruction.
   b. Energize fans and ensure proper rotation.
   c. Measure and record the amount of current draw through each condensing fan.

7. Refrigeration system

   a. Measure and record subcooling and superheat on circuit A with hot-gas reheat valve closed (0%) after 15 minutes of steady-state operation.

b. Measure and record subcooling and superheat on circuit A with hot-gas reheat valve open (100%) after 15 minutes of steady-state operation.
c. Measure and record subcooling and superheat on circuit B after 15 minutes of steady-state operation.

D. Test report shall be provided prior to unit startup and available from the factory upon request.

2.3 CAPAPACITIES AND CHARACTERISTICS

A. As indicated on the drawing schedules.

PART 3 – EXAMINATION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before air-to-air energy recovery equipment installation. Reject insulation materials and filter media that do not comply, or are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for electrical services to verify actual locations of connections before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Unit Support:

1. Install floor-mounted or side discharge units on 4-inch-high housekeeping pad concrete base or minimum height required for proper unit trapping.

B. Install units with clearances for service and maintenance.

C. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

D. Comply with ANSI Z223.1 and CGA B149.1 or CGA B149.2 for field gas piping and venting.

E. Pipe condensate drains from drain pans to nearest floor drain.

3.3 CONNECTIONS

A. Comply with requirements for ductwork specified in Section 23XXXX "Metal Ducts."

B. Install electrical devices furnished with units but not factory mounted.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including all connections.

C. Tests and Inspections:

1. Operational Test: After electrical circuitry has been energized and crankcase heaters have had sufficient on-time, start units to confirm proper motor rotation and unit operation.
2. Enter or adjust all controller set-points as required to meet specific project requirements.
3. Set initial temperature and humidity set points.
4. Set field-adjustable switches as indicated.

D. Air-to-air energy recovery equipment will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 SEQUENCE OF OPERATION

A. As indicated elsewhere in the project documents.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-to-air energy recovery units.

END OF SECTION 23 75 00

SECTION 23 82 39 - UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall and ceiling heaters with propeller fans and electric-resistance heating coils.

1.3 DEFINITIONS

A. BAS: Building automation system.

B. CWP: Cold working pressure.

C. PTFE: Polytetrafluoroethylene plastic.

D. TFE: Tetrafluoroethylene plastic.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Plans, elevations, sections, and details.
2. Location and size of each field connection.
3. Details of anchorages and attachments to structure and to supported equipment.
4. Equipment schedules to include rated capacities, operating characteristics, furnished specialties, and accessories.
5. Location and arrangement of piping valves and specialties.
6. Location and arrangement of integral controls.
7. Wiring Diagrams: Power, signal, and control wiring.

C. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Suspended ceiling components.

2. Structural members to which unit heaters will be attached.
3. Method of attaching hangers to building structure.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating finished ceiling, including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.

6. Perimeter moldings for exposed or partially exposed cabinets.

D. Samples for Initial Selection: Finish colors for units with factory-applied color finishes.

E. Samples for Verification: Finish colors for each type of cabinet unit heater and wall and ceiling heaters indicated with factory-applied color finishes.

F. Manufacturer Seismic Qualification Certification: Submit certification that cabinet unit heaters, accessories, and components will withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

G. Field quality-control test reports.

H. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Cabinet Unit Heater Filters: Furnish one spare filter(s) for each filter installed.

PART 2 - PRODUCTS

2.1 WALL AND CEILING HEATERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:

1. Berko Electric Heating; a division of Marley Engineered Products.
2. Chromalox, Inc.; a division of Emerson Electric Company.
3. Indeeco.
4. Markel Products; a division of TPI Corporation.
5. QMark Electric Heating; a division of Marley Engineered Products.
6. Trane.

D. Description: An assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.

E. Cabinet:

1. Front Panel: Stamped-steel louver, with removable panels fastened with tamperproof fasteners.
2. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.

F. Surface-Mounting Cabinet Enclosure: Steel with finish to match cabinet.

G. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high temperature protection. Provide integral circuit breaker for overcurrent protection.

H. Fan: Aluminum propeller directly connected to motor.

1. Motor: Permanently lubricated, multispeed. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

I. Controls: Unit-mounted thermostat. Low-voltage relay with transformer kit.

J. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

K. Capacities and Characteristics:
   a. Refer to drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for piping and electrical connections to verify actual locations before unit heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall boxes in finished wall assembly; seal and weatherproof. Joint-sealant materials and applications are specified in Division 7 Section "Joint Sealants."

B. Install unit heaters level and plumb.

C. Suspend unit heaters from structure with all-thread hanger rods and spring hangers. Hanger rods and attachments to structure are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Vibration hangers are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

D. Install wall-mounting thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

E. Install new filters in each fan-coil unit within two weeks of Substantial Completion.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect piping to cabinet unit heater's factory, hot-water piping package. Install the piping package if shipped loose.

D. Connect supply and return ducts to cabinet unit heaters with flexible duct connectors specified in Division 23 Section "Duct Accessories."

E. Comply with safety requirements in UL 1995.

F. Unless otherwise indicated, install union and gate or ball valve on supply-water connection and union and calibrated balancing valve on return-water connection of unit heater. Hydronic specialties are specified in Division 23 Section "Hydronic Piping."

G. Ground equipment according to Division 26 Section "Grounding and Bonding."

H. Connect wiring according to Division 26 Section "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.5 ADJUSTING

A. Adjust initial temperature set points.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain cabinet unit heaters. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION 23 82 39

SECTION 260500 GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

B. It is understood that the electrical contractor has, by careful examination of the plans and specifications, and the site where appropriate, satisfied himself as to the nature and location of the work and all conditions which must be met in order to carry out the work under this section of the contract.

1.2 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Grout.
4. Common electrical installation requirements.

1.3 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

PRODUCTS

1.4 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

2.2 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, non-corrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 2 - EXECUTION

2.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

F. The facility has very limited space floor to floor. Every conduit, junction box, etc. must be closely coordinated prior to installation!!! Allow adequate time in the bid for such close coordination.

2.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with fire stop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior penetrations of non-fire rated walls and floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealers".

J. Fire rated assembly penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with fire stop materials.

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

2.3 FIRE STOPPING

A. Apply fire stopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly.

END OF SECTION 260500

SECTION 260519 CONDUCTORS AND CABLES

PART 1 - GENERAL

1.3 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.4 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For testing agency.

C. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.7 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hi-Tech
2. American Insulated Wire Corp.; a Leviton Company.
3. Rome
4. Triangle

C. Copper conductors: Comply with NEMA WC 70.

D. Conductor Insulation: Comply with NEMA WC 70 for Types THW, THHN-THWN, XHHW, and SO.

E. Multiconductor Cable: Comply with NEMA WC 70 for armored cable, Type AC, metal-clad cable, Type MC, mineral-insulated, metal-sheathed cable, Type MI, and Type SO with ground wire.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ilsco
2. Thomas & Betts
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper: Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders concealed in ceilings, walls, partitions, and crawlspaces: Type THHN-THWN, single conductors in raceway.

D. Feeders concealed in concrete, below slabs-on-grade, and underground: Type THHN-THWN, single conductors in raceway.

E. Exposed branch circuits, Including in crawlspaces: Type THHN-THWN, single conductors in raceway.

F. Branch circuits concealed in ceilings, walls, and partitions: Type THHN-THWN, single conductors in raceway or metal clad cable type MC.

G. Branch circuits concealed in concrete, below slabs-on-grade, and underground: Type THHN-THWN, single conductors in raceway.

H. Cord drops and portable appliance connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

I. Class 1 control circuits: Type THHN-THWN, in raceway.

J. Class 2 control circuits: Power-limited cable in raceway or in cable tray.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

D. Support cables according to Division 16 Section 16190 "Hangers and Supports." Metal clad cables shall be supported at intervals not exceeding six (6) feet. Metal clad cables containing 4 or fewer conductors sized number 10 and smaller shall also be supported within 12 inches of every box, cabinet fitting or other cable termination. "Tie wire" will not be accepted as a supporting means. Cables shall not be supported by the ceiling grid or by other installed work such as electrical conduits, sprinkler piping, water piping, gas piping mechanical duct work, etc.

E. Support cables according to Division 16 Section 16190 "Hangers and Supports."

F. Identify and color-code conductors and cables according to Division 16 Section 16195 "Electrical Identification"

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Before energizing feeders, sub-feeders and service entrance conductors, test for electrical continuity short circuits and insulation resistance.

END OF SECTION 260519

SECTION 260526 GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:

1. Ground rods.
2. Ground rings.
3. Grounding arrangements and connections for separately derived systems.

C. Qualification Data: For testing agency and testing agencies field supervisor.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad 5/8 by 96 inches (16 by 2400 mm)] in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 4 AWG and smaller, and stranded conductors for No. 3 AWG and larger, unless otherwise indicated.

B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.

8. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Anti-frost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a grounding bus as shown on plans.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Common Ground Bonding with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service

entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

END OF SECTION 260526

SECTION 260529 HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
1. Equipment supports.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Kindorf
    b. Cooper B-Line, Inc.; a division of Cooper Industries.
    c. Unistrut; Tyco International, Ltd.
    d. Caddy

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) Hilti Inc.
        2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        3) MKT Fastening, LLC.
        4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) Cooper B-Line, Inc.; a division of Cooper Industries.

2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 10 percent in future without exceeding specified design load limits.

C. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

D. "Tie wire" will not be accepted as a supporting method for raceways.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.

6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete.

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 RACEWAYS AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alflex Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Wheatland Tube Company.
4. Wheatland
5. Triangle

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

D. EMT: ANSI C80.3.

E. FMC: Zinc-coated steel or aluminum.

F. LFMC: Flexible steel conduit with PVC jacket.

G. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Fittings for EMT: Steel compression type. Connectors to shall be insulated throat type.

H. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Type EPC-40-PVC unless otherwise indicated.

D. LFNC: UL 1660.

E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

F. Fittings for LFNC: UL 514B.

2.3 METAL WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.
2. Chalfant Mfg. Co.
3. Mono-Systems, Inc.
4. Husky Products Division: Burndy Corporation

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged or Screw-cover type.

E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finishes in color selected by Architect.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Thomas & Betts Corporation.
b. Walker Systems, Inc.; Wiremold Company (The).
c. Wiremold Company (The); Electrical Sales Division.

B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Butler Manufacturing Company; Walker Division.
b. Enduro Systems, Inc.; Composite Products Division.
c. Hubbell Incorporated; Wiring Device-Kellems Division.
d. Lamson & Sessions; Carlon Electrical Products.
e. Panduit Corp.
f. Walker Systems, Inc.; Wiremold Company (The).
g. Wiremold Company (The); Electrical Sales Division.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. EGS/Appleton Electric.
2. Hoffman.
3. RACO; a Hubbell Company.
4. Thomas & Betts Corporation.
5. Midland Ross / Steel City

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1. Boxes to be 4" square x 2 ½" deep with extension rings as required.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Metal Floor Boxes: Cast or sheet metal, fully adjustable, rectangular.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Where exposed to physical damage use Rigid steel conduit or IMC.
2. Concealed Conduit, Aboveground: EMT.
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC or LFNC.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not subject to physical damage: EMT.
2. Exposed and Subject to physical damage: Rigid steel conduit or IMC. Includes raceways in the following locations:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. At condenser rack locations
    d. Installed on walls up to 3 feet above finish floor.

3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
5. Damp or Wet Locations: EMT with rain tight fittings.
6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, non-metallic in damp or wet locations.

C. Minimum Raceway Size: 1/2-inch (16-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

2. EMT: Use steel set-screw or compression type couplings and connectors. Indent type fittings are not approved.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 16 Section 16190 "Hangers and Supports"

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

J. Use insulating bushings to protect conductors at raceway terminations.

K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

3. Install expansion fittings that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change.

4. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

M. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

N. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

O. Set metal floor boxes level and flush with finished floor surface.

P. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit.
2. Install standard warning tape approximately 12" above buried conduits.
3. After installing conduit, backfill and compact.

3.4 FIRE STOPPING

A. Apply fire stopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.5 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260553

SECTION 260536 CABLE TRAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes steel and aluminum cable trays and accessories.

1.3 SUBMITTALS

A. Product Data: Include data indicating dimensions and finishes for each type of cable tray indicated.

B. Shop Drawings: For each type of cable tray.

1. Show fabrication and installation details of cable tray, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.
2. Seismic-Restraint Details: Signed and sealed by a qualified professional engineer, licensed in the state where Project is located, who is responsible for their preparation.

    a. Design Calculations: Calculate requirements for selecting seismic restraints.
    b. Detail fabrication, including anchorages and attachments to structure and to supported cable trays.

C. Coordination Drawings: Floor plans and sections, drawn to scale. Include scaled cable tray layout and relationships between components and adjacent structural, electrical, and mechanical elements. Show the following:

1. Vertical and horizontal offsets and transitions.
2. Clearances for access above and to side of cable trays.
3. Vertical elevation of cable trays above the floor or bottom of ceiling structure.

D. Field quality-control reports.

E. Operation and Maintenance Data: For cable trays to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain cable tray components through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Steel cable tray, hot dip galvanized after fabrication, Aluminum cable tray may be stored outside without cover, but shall be loosely stacked, elevated off the ground, and ventilated to prevent staining during storage.

B. Store indoors to prevent water or other foreign materials from staining or adhering to cable tray. Unpack and dry wet materials before storage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Chalfant Manufacturing Company.
2. Cooper B-Line, Inc.
3. Cope, T. J., Inc.; a subsidiary of Allied Tube & Conduit.
4. GS Metals Corp.; GLOBETRAY Products.
5. MONO-SYSTEMS, Inc.
6. MPHusky.
7. PW Industries.

2.2 MATERIALS AND FINISHES

A. Cable Trays, Fittings, and Accessories: Steel, complying with NEMA VE 1.
1. Hot-dip galvanized after fabrication, complying with ASTM A 123/A 123M, Class B2; with chromium-zinc hardware.

B. Cable Trays, Fittings, and Accessories: Aluminum, complying with NEMA VE 1, Aluminum Association's Alloy 6063-T6 for rails, rungs, and cable trays, and Alloy 5052-H32 or Alloy 6061-T6 for fabricated parts; with chromium-zinc splice-plate fasteners, bolts, and screws

C. Sizes and Configurations: Refer to the cable tray descriptions on drawings for specific requirements for types, materials, sizes, and configurations.

2.3 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

B. Barrier Strips: Same materials and finishes as cable tray.

C. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

2.4 WARNING SIGNS

A. Lettering: 1-1/2-inch- (40-mm-) high, black letters on yellow background with legend "WARNING! NOT TO BE USED AS WALKWAY, LADDER, OR SUPPORT FOR LADDERS OR PERSONNEL."

PART 3 - EXECUTION

3.1 CABLE TRAY INSTALLATION

A. Comply with recommendations in NEMA VE 2. Install as a complete system, including all necessary fasteners, hold-down clips, splice-plate support systems, barrier strips, hinged horizontal and vertical splice plates, elbows, reducers, tees, and crosses.

B. Remove burrs and sharp edges from cable trays.

C. Fasten cable tray supports to building structure and install seismic restraints if required.

1. Design each fastener and support to carry load indicated by seismic requirements.
2. Place supports so that spans do not exceed maximum spans on schedules.
3. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.
4. Support bus assembly to prevent twisting from eccentric loading.
5. Manufacture center-hung support, designed for 60 percent versus 40 percent eccentric loading condition, with a safety factor of 3.

D. Install expansion connectors where cable tray crosses building expansion joints.

E. Make changes in direction and elevation using standard fittings.

F. Make cable tray connections using standard fittings.

G. Seal penetrations through fire and smoke barriers to maintain original barrier ratings.

H. Sleeves for Future Cables: Install capped sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.

I. Workspace: Install cable trays with enough space to permit access for installing cables.

J. Install barriers to separate cables of different systems, such as power, communications, and data processing; or of different insulation levels.

K. After installation of cable trays is completed, install warning signs in visible locations on or near cable trays.

3.2 CABLE INSTALLATION

A. Install cables only when cable tray installation has been completed and inspected.

B. Fasten cables on horizontal runs with cable clamps or cable ties as recommended by NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.

C. On vertical runs, fasten cables to tray every 18 inches (457 mm). Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

D. In existing construction, remove inactive or dead cables from cable tray.

E. Install covers after installation of cable is completed.

3.3 CONNECTIONS

A. Ground cable trays according to manufacturer's written instructions.

B. Install an insulated equipment grounding conductor with cable tray, in addition to those required by NFPA 70.

3.4 FIELD QUALITY CONTROL

A. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements. Perform the following field quality-control survey:

1. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable tray, vibration, and thermal expansion and contraction conditions, which may cause or have caused damage.
2. Verify that the number, size, and voltage of cables in cable tray do not exceed that permitted by NFPA 70. Verify that communication or data-processing circuits are separated from power circuits by barriers.
3. Verify that there is no intrusion of such items as pipe, hangers, or other equipment that could damage cables.
4. Remove deposits of dust, industrial process materials, trash of any description, and any blockage of tray ventilation.
5. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and re-torque in suspect areas.
6. Check for missing or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
7. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable tray.

B. Report results in writing.

3.5 PROTECTION

A. Protect installed cable trays.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by cable tray manufacturer.
3. Install temporary protection for cables in open trays to protect exposed cables from falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials until the risk of damage is over.

END OF SECTION 260536

SECTION 260537 DATA/COMMUNICATIONS RACEWAYS AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Conduit requirements
2. Outlet box requirements
3. Equipment backboards

PART 2 - EXECUTION

2.1 ENTRANCE FACILITIES

A. Furnish and install empty conduits with pull strings as noted on the drawings for the service entrance to the building. Coordinate installation of service conduits with the communications service provider.

2.2 COMMON REQUIREMENTS FOR DATA INSTALLATION

A. Furnish and install a system of raceways, wall outlet boxes, equipment boards, etc. as indicated on the drawings and as specified herein.

B. Raceways, boxes, etc. shall be in compliance with the relevant sections of these specifications.

C. Wall outlet shall consist of a standard 4" square x 2 ½" deep outlet box with a single gang extension ring.

D. Voice/Data equipment boards shall be of the size noted or shown on drawings and shall be constructed from ¾" plywood with the finish grade facing the front. Paint the backboard with two coats of gray, fire retardant paint.

E. Furnish and install the telephone/data/low voltage cable tray as specified as shown on drawings.

F. Install sleeves for penetrations of fire rated assemblies where shown on drawings. Cut sleeves to length for mounting flush with wall surfaces.

G. Extend sleeves installed in floors 2 inches (50mm) above finished floor level.

H. Seal space outside of sleeves with grout for penetrations in concrete or masonry:

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth. Protect grout until fully cured.

I. Voice/Data system cabling, jacks, plates, patch panels, racks, etc. shall be furnished and installed as part of the electrical contract. Refer to division 27 for detailed specifications.

END OF SECTION 260537

260548 VIBRATION AND SEISMIC CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Channel support systems.
   2. Restraint cables.
   3. Hanger rod stiffeners.
   4. Anchorage bushings and washers.

B. Related Sections include the following:

   1. Division 26 Section "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.3 DEFINITIONS

A. The IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

   1. Site Class as Defined in the IBC: C
   2. Assigned Seismic Use Group or Building Category as Defined in the IBC: II.

1.5 SUBMITTALS

A. Product Data: For the following:

   1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

      a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear.
      b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Delegated-Design Submittal: For seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators and seismic restraints.

a. Coordinate design calculations with wind-load calculations required for equipment mounted outdoors. Comply with requirements in other Division 26 Sections for equipment mounted outdoors.

2. Indicate materials and dimensions and identify hardware, including attachment and anchorage devices.
3. Field-fabricated supports.
4. Seismic-Restraint Details:

a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events.
c. Pre-approval and Evaluation Documentation: By OSHPD, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

C. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.

D. Welding certificates.

E. Qualification Data: For professional engineer and testing agency.

F. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage pre-approval OPA number from OSHPD maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If pre-approved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

E. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SEISMIC-RESTRAINT DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kindorf
2. Cooper B-Line, Inc.; a division of Cooper Industries.
3. Unistrut; Tyco International, Ltd.

C. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by OSHPD.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least two times the maximum seismic forces to which they will be subjected.

D. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

E. Restraint Cables: ASTM A 603 galvanized steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

F. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or reinforcing steel angle clamped to hanger rod. Do not weld stiffeners to rods.

G. Bushings for Floor-Mounted Equipment Anchor: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchors and studs.

H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices.

I. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

J. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

K. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.2 FACTORY FINISHES

A. Finish: Manufacturer's standard prime-coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by OSHPD.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment and Hanger Restraints:

1. Install restrained isolators on electrical equipment as required by project seismic classification.
2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
3. Install seismic-restraint devices using methods approved by OSHPD.

B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

D. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

END OF SECTION 260548

SECTION 260553 ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Identification for raceway and metal-clad cable.
2. Identification for conductors and communication and control cable.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.
8. Receptacles/Cover Plates

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.145.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Color for Printed Legend:

1. Power Circuits: Black letters on an orange field.
2. Legend: Indicate system or service and voltage, if applicable.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands: Slit, pre-tensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.2 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

C. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- (0.35-mm-) thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.

D. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking nylon tie fastener.

E. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.3 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.

1. Not less than 6 inches (150 mm) wide by 4 mils (0.102 mm) thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend shall indicate type of underground line.

2.4 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, non-fading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.5 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.6 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

E. Stenciled Legend: In non-fading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength: 50 lb (22.6 kg), minimum.
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black, except where used for color-coding.

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 APPLICATION

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with orange snap-around label.

B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, snap-around, color-coding bands:

1. Fire Alarm System: Red.
2. Fire-Suppression Supervisory and Control System: Red and yellow.
3. Combined Fire Alarm and Security System: Red and blue.
4. Security System: Blue and yellow.
5. Mechanical and Electrical Supervisory System: Green and blue.
6. Telecommunication System: Green and yellow.
7. Control Wiring: Green and red.

C. Power-Circuit Conductor Identification: For primary and secondary conductors No.1/0 AWG and larger in vaults, pull and junction boxes, manholes, and hand holes use aluminum wraparound marker labels. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use write-on tags. Identify each ungrounded conductor according to source and circuit number.

E. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

F. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.

G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply baked-enamel warning signs. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

H. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where 2 lines of text are required, use labels 2 inches (50 mm) high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label 4 inches (100 mm) high.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:

    a. Panelboards, electrical cabinets, and enclosures.
    b. Access doors and panels for concealed electrical items.
    c. Electrical switchgear and switchboards.
    d. Transformers.
    e. Disconnect switches.
    f. Enclosed circuit breakers.
    g. Motor starters.
    h. Push-button stations.
    i. Contactors.
    j. Fire-alarm control panel and annunciators.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.
2. Colors for 208/120-V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.

3. Colors for 480/277-V Circuits:

    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow.

4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade or a minimum of 12" above buried lines. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.

J. Painted Identification: Prepare surface and apply paint according to Division 09 "Paints" section.

K. Receptacles: Apply clear label with printed black letters identifying source panel and circuit.

END OF SECTION 260553

SECTION 262200 LOW VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:

1. Distribution transformers.
2. Buck-boost transformers.

1.3 SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Manufacturer Seismic Qualification Certification: Submit certification that transformers, accessories, and components will withstand seismic forces defined in Division 26 Section 260548 "Vibration and Seismic Controls." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For testing agency.

E. Source quality-control test reports.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.6 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. General Electric Company.
2. Cutler Hammer
3. Square D. Company
4. Siemens

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.

1. Internal Coil Connections: Brazed or pressure type.
2. Coil Material: Copper or Aluminum

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20 and list and label as complying with UL 1561.

B. Cores: One leg per phase.

C. Enclosure: Ventilated, NEMA 250, Type 2.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

D. Transformer Enclosure Finish: Comply with NEMA 250.

1. Finish Color: Gray.

E. Taps for Transformers Smaller than 3 kVA: One 5 percent tap above normal full capacity.

F. Taps for Transformers 7.5 to 24 kVA: Two 5 percent taps below rated voltage.

G. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and four 2.5 percent taps below normal full capacity.

H. Insulation Class: 115 deg C, UL-component-recognized insulation system for transformers 30 KVA and below, 150 deg C, for transformers larger than 30 KVA.

I. Wall Brackets: Manufacturer's standard brackets.

J. Fungus Proofing: Permanent fungicidal treatment for coil and core.

2.4 BUCK-BOOST TRANSFORMERS

A. Description: Self-cooled, two-winding dry type, rated for continuous duty and with wiring terminals suitable for connection as autotransformer. Transformers shall comply with NEMA ST 1 and shall be listed and labeled as complying with UL 506 or UL 1561.

B. Enclosure: Ventilated, NEMA 250, Type 2.

1. Finish Color: Gray.

2.5 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution or buck-boost transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Division 26 Section 260553 "Electrical Identification."

2.6 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.91.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Division 26 Section 260526 "Grounding and Bonding" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

B. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions and seismic codes applicable to Project.

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section 260526 "Grounding and Bonding".

B. Connect wiring according to Division 26 Section 260519 "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

B. Remove and replace units that do not pass tests or inspections and retest as specified above.

C. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 262200

SECTION 262413 SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes service and distribution switchboards rated 600 V and less.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. RFI: Radio-frequency interference.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each switchboard and related equipment.

1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Enclosure types and details for types other than NEMA 250, Type 1.
b. Bus configuration, current, and voltage ratings.
c. Short-circuit current rating of switchboards and overcurrent protective devices.
d. Descriptive documentation of optional barriers specified for electrical insulation and isolation.
e. Mimic-bus diagram.
f. UL listing for series rating of installed devices.
g. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

2. Wiring Diagrams: Power, signal, and control wiring.

C. Qualification Data: For testing agency.

D. Field quality-control test reports including the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals.

1. Routine maintenance requirements for switchboards and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain switchboards through one source from a single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NEMA PB 2, "Deadfront Distribution Switchboards."

E. Comply with NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver in sections or lengths that can be moved past obstructions in delivery path.

B. Store indoors in clean dry space with uniform temperature to prevent condensation. Protect from exposure to dirt, fumes, water, corrosive substances, and physical damage.

C. If stored in areas subjected to weather, cover switchboards to provide protection from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside switchboards; install electric heating (250 W per section) to prevent condensation.

D. Handle switchboards according to NEMA PB 2.1 and NECA 400.

1.7 PROJECT CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2000 m).

C. Service Conditions: NEMA PB 2, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

D. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect and Owner no fewer than seven days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3: Do not proceed with interruption of electric service without Owner's written permission.

1.8 COORDINATION

A. Coordinate layout and installation of switchboards and components with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Potential Transformer Fuses: Equal to 10 percent of amount installed for each size and type, but no fewer than 2 of each size and type.
2. Control-Power Fuses: Equal to 10 percent of amount installed for each size and type, but no fewer than 2 of each size and type.
3. Fuses and Fusible Devices for Fused Circuit Breakers: Equal to 10 percent of amount installed for each size and type, but no fewer than 3 of each size and type.
4. Fuses for Fused Switches: Equal to 10 percent of amount installed for each size and type, but no fewer than 3 of each size and type.
5. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of amount installed for each size and type, but no fewer than 3 of each size and type.
6. Indicating Lights: Equal to 10 percent of amount installed for each size and type, but no fewer than 1 of each size and type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 MANUFACTURED UNITS

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Protection Div.
3. Square D. Company
4. Siemens

B. Front- and Side-Accessible Switchboard: Fixed, individually mounted main device; panel-mounted branches; and sections rear aligned.

C. Nominal System Voltage: As shown on drawings.

D. Main-Bus Continuous: As shown on electrical drawings

E. Enclosure: Steel, NEMA 250, Type 1.

F. Enclosure Finish for Outdoor Units: Factory-applied finish in manufacturer's standard color, undersurfaces treated with corrosion-resistant undercoating.

G. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

H. Barriers: Between adjacent switchboard sections.

I. Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.

J. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

K. Buses and Connections: Three phase, four wire, unless otherwise indicated.
1. Phase- and Neutral-Bus Material: Tin-plated, high-strength, electrical-grade aluminum alloy with copper- or tin-plated, aluminum circuit-breaker line connections.
2. Ground Bus: 1/4-by-2-inch- (6-by-50-mm-) minimum-size, hard-drawn copper of 98 percent conductivity.
3. Contact Surfaces of Buses: Silver plated.
4. Main Phase Buses, Neutral Buses, and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections.
5. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.
6. Neutral Buses: 100 percent of the ampacity of phase buses, unless otherwise indicated.

L. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.3 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 3, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip-unit circuit breakers shall have RMS sensing, field-replaceable rating plug, and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with 5 mA trip sensitivity.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

C. Enclosed, Insulated-Case Circuit Breaker: Fully rated, encased-power circuit breaker with interrupting capacity rating to meet available fault current.

1. Fixed circuit-breaker mounting.
2. Two-step, stored-energy closing.
3. Microprocessor-based trip units with interchangeable rating plug, LED trip indicators, and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments with I^2t response.
    d. Ground-fault pickup level, time delay, and I^2t response.

4. Control Voltage: 125-V, ac.
5. Service-Rated Switches: Labeled for use as service equipment.

2.4 INSTRUMENTATION

A. Instrument Transformers: NEMA EI 21.1, IEEE C57.13, and the following:

1. Potential Transformers: Secondary voltage rating of 120 V and NEMA accuracy class of 0.3 with burdens of W, X, and Y.
2. Current Transformers: Ratios shall be as indicated with accuracy class and burden suitable for connected relays, meters, and instruments.
3. Control-Power Transformers: Dry type, mounted in separate compartments for units larger than 3 kV.
4. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondaries to ground overcurrent relays to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker ground-fault protection.

B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:

1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:

a. Phase Currents, Each Phase: Plus or minus 1 percent.
b. Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.
d. Kilowatts: Plus or minus 2 percent.
e. Megavars: Plus or minus 2 percent.
f. Power Factor: Plus or minus 2 percent.
g. Frequency: Plus or minus 0.5 percent.
h. Kilowatt Demand: Plus or minus 2 percent; demand interval programmable from 5 to 60 minutes.
i. Accumulated Energy, Kilowatt Hours: Plus or minus 2 percent. Accumulated values unaffected by power outages up to 72 hours.

2. Mounting: Display and control unit flush or semi-flush mounted in instrument compartment door.

2.5 CONTROL POWER

A. Control Circuits: 120 V, supplied through secondary disconnecting devices from control-power transformer.

B. Control-Power Fuses: Primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.

C. Control Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Fungus Proofing: Permanent fungicidal treatment for switchboard interior, including instruments and instrument transformers.

PART 3 - EXECUTION

3.1 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

3.2 EXAMINATION

A. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Install switchboards and accessories according to NEMA PB 2.1 and NECA 40.

B. Install and anchor switchboards level on concrete bases, 4-inch (100-mm) nominal thickness. Concrete base is specified in Division 26 Section 260529 "Hangers and Supports", and concrete materials and installation requirements are specified in Division 03.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.
2. For switchboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to switchboards.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

D. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

E. Install overcurrent protective devices, transient voltage suppression devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.

3.4 IDENTIFICATION

A. Switchboard Nameplates: Label each switchboard compartment with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.5 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

3.6 CLEANING

A. On completion of installation, inspect interior and exterior of switchboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 262413

SECTION 262416 PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. RFI: Radio-frequency interference.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Enclosure types and details for types other than NEMA 250, Type 1.
b. Bus configuration, current, and voltage ratings.
c. Short-circuit current rating of panelboards and overcurrent protective devices.
d. UL listing for series rating of installed devices.
e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

2. Wiring Diagrams: Power, signal, and control wiring.

C. Manufacturer Seismic Qualification Certification: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 16 Section 16548 "Vibration and Seismic Controls". Include the following:

1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
   b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For testing agency.

E. Field quality-control test reports including the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

F. Panelboard Schedules: For installation in panelboards.

G. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Closeout Procedures," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of panelboards and are based on the specific system indicated.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect and Owner no fewer than seven days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.

1.7 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Six spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:

a. Eaton Corporation; Cutler-Hammer Products.
b. General Electric Co.; Electrical Distribution & Protection Div.
c. Square D. Company
d. Siemens

2.2 MANUFACTURED UNITS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

B. Enclosures: Flush and surface mounted cabinets. NEMA PB 1, Type 1.

1. Rated for environmental conditions at installed location.

    a. Outdoor Locations: NEMA 250, Type 3R

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
5. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.
6. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
7. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.

C. Phase and Ground Buses:

1. Material: Tin-plated aluminum.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
3. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.

D. Conductor Connectors: Suitable for use with conductor material.

1. Main and Neutral Lugs: Mechanical type.
2. Ground Lugs and Bus Configured Terminators: Mechanical type.
3. Feed-Through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
4. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

E. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.

F. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. UL label indicating series-connected rating with integral or remote upstream overcurrent protective devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating.

B. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 DISTRIBUTION PANELBOARDS

A. Doors: Secured with vault-type latch with tumbler lock; keyed alike. Omit for fused-switch panelboards.

B. Main Overcurrent Protective Devices: Circuit breaker.

C. Branch Overcurrent Protective Devices:

1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.5 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.6 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: UL 489, with series-connected rating to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip-unit circuit breakers shall have RMS sensing; field-replaceable rating plug; and with the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with 5 mA trip sensitivity.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.

5. Multi-pole units enclosed in a single housing.

2.7 ACCESSORY COMPONENTS AND FEATURES

A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Fungus Proofing: Permanent fungicidal treatment for panelboard interior, including overcurrent protective devices and other components.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mount top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.

C. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

D. Install overcurrent protective devices and controllers.

1. Set field-adjustable switches and circuit-breaker trip ranges.

E. Install filler plates in unused spaces.

F. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

A. Create a directory to indicate installed circuit loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable. Verify final room names and/or numbers prior to installation of permanent directories in panelboards.

B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.4 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 262416

SECTION 262726 WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Wall-box occupancy sensors.
3. Snap switches and wall-box dimmers.
4. Cord and plug sets.
5. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Bryant
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour
5. Arrow Hart

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

a. Bryant 5352
b. Hubbell 5352
c. Leviton 5352
d. Eagle 5352

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, non-feed through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Bryant GFR53FT
b. Hubbell GF5362
c. Leviton 6898-HG
d. Arrow Hart GF5362

2.4 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.5 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Bryant; 4901 (single pole), 4903 (three way), 4904 (four way).
b. Hubbell; 1221 (single pole), 1223 (three way), 1224 (four way).
c. Leviton; 1221 (single pole), 1223 (three way), 1224-2 (four way).
d. Eagle; 2221 (single pole), 2223 (three way), 2224 (four way).

2.6 ALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider with single-pole or three-way switching. Comply with UL 1472.

C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.

1. 600 W; dimmers shall require no derating when ganged with other devices.

D. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.7 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished stainless steel..
3. Material for Unfinished Spaces: Galvanized steel.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant die-cast aluminum with lockable cover.

2.8 MULTIOUTLET ASSEMBLIES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Wiremold Company (The).
3. Panduit

B. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: PVC.

D. Wire: No. 12 AWG.

2.9 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring devices shall be ivory unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

C. Coordination with case work, book shelves, and other furniture.

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

D. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail, or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pig tailing existing conductors is permitted provided the outlet box is large enough.

E. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

F. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left.

G. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

H. Dimmers:

1. Install dimmers within terms of their listing.

2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

I. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

J. Label all receptacle source panel and circuit with clear plastic label with black letters.

END OF SECTION 262726

SECTION 262813 FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Cartridge fuses rated 600 V and less for use in safety switches.
2. Spare-fuse cabinets.

1.3 SUBMITTALS

A. Product Data: Include the following for each fuse type indicated:

1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
2. Let-through current curves for fuses with current-limiting characteristics.
3. Time-current curves, coordination charts and tables, and related data.
4. Fuse size for elevator feeders and elevator disconnect switches.

B. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

1. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
2. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA FU 1.

D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Furnish 6 spare fuses of each size and voltage rating.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussman, Inc.
2. Ferraz Shawmut, Inc.
3. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

2.3 SPARE-FUSE CABINET

A. Cabinet: Wall-mounted, 0.05-inch- (1.27-mm-) thick steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
2. Finish: Gray, baked enamel.
3. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on exterior of door.
4. Fuse Pullers: For each size of fuse.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Motor Branch Circuits: Class RK1, time delay.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 262813

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other all Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following individually mounted, enclosed switches and circuit breakers:

1. Fusible switches.
2. Non-fusible switches.
3. Molded-case circuit breakers.
4. Molded-case switches.
5. Enclosures.

1.3 DEFINITIONS

A. GD: General duty.

B. GFCI: Ground-fault circuit interrupter.

C. HD: Heavy duty.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current rating.
4. UL listing for series rating of installed devices.
5. Features, characteristics, ratings, and factory settings of individual over current protective devices and auxiliary components.

B. Manufacturer Seismic Qualification Certification: Submit certification that enclosed switches and circuit breakers, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems" Include the following:

1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

C. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.6 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Spares: For the following:
    a. Fuses for Fusible Switches: 1 complete of type furnished and installed (where switch is furnished by the electrical contractor).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Manufacturers:

   1. Eaton Corporation; Cutler-Hammer Products.
   2. General Electric Co.; Electrical Distribution & Control Division.
   3. Siemens Energy & Automation, Inc.
   4. Square D/Group Schneider.

B. Fusible Switch, 1200 A and Smaller: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Non-fusible Switch, 1200A and Smaller: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D. Accessories:

   1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
   3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

2.3 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Manufacturers:

   1. Eaton Corporation; Cutler-Hammer Products.
   2. General Electric Co.; Electrical Distribution & Control Division.
   3. Siemens Energy & Automation, Inc.
   4. Square D/Group Schneider.

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

   1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

3. Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.
4. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.

C. Molded-Case Circuit-Breaker Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
4. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
5. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.

D. Molded-Case Switches: Molded-case circuit breaker with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

E. Molded-Case Switch Accessories:

1. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.
2. Application Listing: Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage. Provide "dummy" trip unit where required for proper operation.

2.4 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

C. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Identification for Electrical Systems."

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 26 Section "Identification for Electrical Systems."

C. Set field-adjustable switches and circuit-breaker trip ranges.

3.4 CLEANING

A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION 262816

SECTION 265100 INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Interior lighting fixtures, lamps, and ballasts.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Ballast.
4. Energy-efficiency data.
5. Life, output, and energy-efficiency data for lamps.
6. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

a. For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by the manufacturer.
b. Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.

B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.

C. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

D. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Plastic Diffusers and Lenses: 5 for every 100 of each type and rating installed. Furnish at least one of each type.
   2. Battery and Charger Data: One for each emergency lighting unit.
   3. Drivers: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
   4. Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

B. In Interior Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
   1. Basis-of-Design Product: The design for each lighting fixture is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Metal Parts: Free of burrs and sharp corners and edges.

C. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

F. Plastic Diffusers, Covers, and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

    a. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless different thickness is indicated.
    b. UV stabilized.

2. Glass: Annealed crystal glass, unless otherwise indicated.
3. Static Fixture: Air supply slots are blanked off, and fixture appearance matches active units.

2.3 EXIT SIGNS

A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
1. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.
2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

    a. Battery: Sealed, maintenance-free, nickel-cadmium type.
    b. Charger: Fully automatic, solid-state type with sealed transfer relay.
    c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
    d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.4 EMERGENCY LIGHTING UNITS

A. Description: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.5 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).

B. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

C. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Use grid as a support element.

1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

C. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

D. Adjust amiable lighting fixtures to provide required light intensities.

3.2 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and re-transfer to normal.

END OF SECTION 265100

SECTION 271100 MOUNTING ELEMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and all specification sections apply to this section.

1.2 REFERENCES

A. ANSI/EIA-310-D – Electronic Industries Association Standard for Cabinets, Racks, Panels and Associated Equipment

B. ASTM B633 – Specification for Electro-Deposited Coatings of Zinc on Iron and Steel

C. ANSI/NFPA 70 – National Electrical Code

D. ASTM A1008 – Standard Specification For Steel: Sheet, Cold-Rolled Carbon, Structural and High-Strength Low Alloy

PART 2 - PRODUCTS AND INSTALLATION

2.1 FOUR POST EQUIPMENT RACKS

A. 23"W x 23"D x 84"H self-supporting aluminum equipment rack (Panduit P/N NF4PR84 or equivalent) with 12" relay rack runway support (B-Line/Saunders P/N SB-2133-12-FB or equivalent), 1.5" x 12" tubular stringer style cable runway with 9" spacing (B-Line/Saunders P/N SB-17-12-FB or equivalent), 12" runway wall support kit (B-Line/Saunders P/N SB-2113-12-FB or equivalent) and PVC end caps for end of cable runway (B-Line/Saunders P/N SB-110-A-1-FB or equivalent). Equipment rack must be secured to the floor and wall using approved methods and materials.

B. All rack configurations shall be verified with the owner prior to installation.

2.2 CABINETS

A. Provide metal electronic enclosures of types and sizes indicated.

B. Material and specifications for each enclosure are as follows:

1. Electronic enclosure frame shall be cornerless frame design utilizing tubular top and base frames combined with extruded aluminum center posts.
2. Overall cabinet height shall be 78 ¾" (42U) inches.
3. Overall cabinet width shall be 23 inches.
4. Cabinet depth shall be 23 inches.
5. Mounting rails shall be spaced 19 inches wide and shall conform to EIA-310-D.
6. Mounting rails shall contain .375 inch square holes for universal server mounting.
7. Interchangeable top panels shall be vented 18 gauge steel.
   a. Top panel number 1 shall have a bushed cable opening.

b. Top panel number 2 shall have 3-105 CFM fans (315 CFM total).
c. For 39-3/8 " and 47 ¼" deep cabinets only, top panel number 3 shall have 3-105 CFM fans (315 CFM total).

C. Finishes
1. Electronic enclosures shall be light gray powder coat with blue trim.
2. Mounting rails shall be yellow zinc (ASTM B633)

2.3 LOADING CAPACITIES

A. Electronic enclosures shall have a maximum static load capacity of 1400 lbs.

2.4 FIBER OPTIC CABLE CABINETS

A. A rack mount fiber optic cable cabinet will be installed in each closet. The cabinet shall be Corning P/N CCH-04U (MDF), or equivalent with ST fiber optic adapter panels Corning P/N CCH-CP06-G5 or equivalent). IDF cabinets shall be Corning P/N CCH-02U or equivalent. Acceptable equivalents shall be as manufactured by Panduit, Systimax and Ortronics. All fiber optic terminations shall be ST type and shall be Corning P/N 95-050-98 or equivalent. Acceptable equivalents shall be as manufactured by Panduit, Systimax and Ortronics.

END OF SECTION 271100

SECTION 271200 COMMUNICATIONS GROUNDING AND BONDING

PART 1 - GENERAL

1.1 REQUIREMENTS

A. Grounding shall conform to ANSI/TIA/EIA 607(A), The National Electrical Code, ANSI/NEC/BICSI-568 and manufacturer's grounding requirements as a minimum.

B. Bond and ground equipment racks, housings, messenger cables, raceways and armored fiber.

C. Connect cabinets, racks and frames to a single point ground which is connected to the building ground system via a #4 AWG green insulated copper grounding conductor.

D. Telecommunications Main Bus Bar:

1. Connectors: Mechanical type, cast silicon bronze, soldersless type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 2 inches wide by 12 inches long.
3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

END OF SECTION 271200

SECTION 28 05 37 SECURITY DATA COMMUNICATIONS - DISTRIBUTED ANTENNA SYSTEM

PART 1 – GENERAL

1. Section includes
   A. Provide and test a compete distributed antenna system (DAS). Refer to part 3 for installation requirements.
   B. Guilford County preferred DAS vendor as the system must be fully integrated with the existing systems in adjacent buildings: Contact for turnkey pricing
      a. Mobile Communications America,
         Authorized Motorola Retailer
         Authorized Longent Re-seller
         C/O Mark Perretti
         919.810.0667
         MarkPerretti@callmc.com

2. Design Requirements
   A. System design shall take into account:
      a. Potential sources of interference.
      b. Actual building construction materials.
      c. Expected traffic in every area and density shall be provided to accommodate a 30 percent increase in capacity.
      d. Coordination with all other trades prior to bid to ensure that all infrastructure requirements for the DAS are included in the project bid pricing. This shall include, but not limited to, power, ventilation, raceways, structural support, seismic restraint, etc.
   B. BDA shall be located to minimize disruptions to other systems.

3. Performance requirements
   A. The project will provide Guilford County Law Enforcement Center (GCLEC) Public Safety coverage enhancement for Greensboro / Guilford County P25 Simulcast. Optional to the scope may also include 700 MHz coverage capability for future FirstNet compatibility. Provide additional cost (if any) for the FirstNet compatibility on the bid form.
   B. The DAS will be designed as either an active system or a passive system, consisting of head-end and remote components connected via a fiber distribution and/or coax cable, and shall include DAS antennas connected via coaxial cable. The head-end equipment will interface with signal sources for each of the integrated systems, assumed in this proposal to be BDA's and repeaters with exterior "donor" antennas.

4. Submittals
   A. Product data: Submit for each type:
      a. Bi-Directional Amplifiers and Repeaters.
      b. Coaxial Cable and Connectors.
      c. Splitters, Combiners, and Couplers
      d. Fiber Optic Master Unit
      e. Fiber Optic Remote Unit
      f. Fiber Optic Cable and Connectors.
   B. Shop drawings: Submit for each type:
      a. System Overview / Plumbing diagram.
      b. Overlay of System Components on Floor Plans. Coordination drawings to ensure adequate space is maintained. Donor Antenna Lightning Suppression and Grounding details. DAS contractor shall be responsible for providing or having sub-contractor to provide in base bid.
      c. RF Link Budget.
      d. "Heat Map" Predictions for all coverage areas showing design will meet required signal levels.
   C. Following the system commissioning, provide the following:

a. As-Built system design documentation including design assumptions, power budgets, system block diagram, and floor plans showing cable routing, antenna locations, and equipment locations.
b. Product data sheets for all electronic equipment, fiber and coaxial cable, splitters, couplers, and antennas.
c. Final bill of materials.
d. Scanner walk data maps verifying system meets design requirements including:
    1. -95 dBm RSSI for control channels over 95% or greater of coverage area.
    2. -95 dBm RSSI for control channels over 99% or greater of critical areas.
e. Commissioning data showing actual off-air downlink levels at BDA, isolation between donor antenna and DAS antennas in both uplink and downlink directions 15 dB or greater above system gain, AGC and alarm settings.

5. Quality assurance
    A. Perform the required system design and provide suitable documentation.
    B. Adhere to all federal, state and local codes.

6. Coordination
    A. Coordinate design criteria, design approval, and acceptance testing with the authority having jurisdiction (AHJ).
    B. Coordinate installation with the prime contractor and other subcontractors as required. Coordination drawings must be provided and agreed upon by all parties prior to installation. NOTE: The building has very limited height on each floor- ALL pipes, conduits, j-hooks, ducts, fire alarm, etc. must be coordinated in GREAT DETAIL!

PART 2 – PRODUCTS

1. Equipment
    A. Bi-Directional Amplifiers and Repeaters.
    B. Coaxial cable and connectors.
    C. Splitters, Combiners, and Couplers.
    D. Fiber optic Master Unit.
    E. Fiber optic Remote Unit.
    F. Fiber optic cable and connectors.
2. Components
    A. Networks:
        a. Greensboro/Guilford County 800 MHz P25.
        b. Option for future 700 MHz FirstNet compatibility.
    B. Coverage:
        a. -95 dBm over 95% or greater of total coverage area for all systems.
        b. -95 dBm over 99% of critical areas as identified by IFC for all systems.
    C. Supported DAS Bandwidth equipment:
        a. Passive: 700 – 2700 MHz
        b. Active (if needed): Equipped for 800 MHz Public Safety, 700 MHz FirstNet option.
3. Miscellaneous
    A. Coaxial cabling: Plenum rated for all cable indoor cabling.
    B. Fiber optic cabling. Plenum rated for all indoor cabling.
    C. Passive components: industry standard specification Low PIM.
    D. Grounding to meet NEC requirements.

PART 3 – EXECUTION

1. Installation, general
    A. Provide the physical installation of the DAS elements, including (but not limited to) coaxial cable and associated hangers, coaxial connectors, fiber optic cables and fiber connectors and fusion splicing,

antennas, passive components, BDAs, head-end equipment, remote equipment, grounding systems, cable markers, racks, UPSs / Battery Backup, fire panel interface, seismic restraints as required by Code, and associated equipment and materials required for the function of the system described above if needed. Installation shall be turnkey.

B. Perform testing of the cable infrastructure in the form of sweep tests for coaxial cable and OTDR tests for the fiber infrastructure if needed.
C. Perform the integration of the system including the commissioning of the active DAS elements, the BDAs, and integration of the signal sources into the DAS.
D. Perform system testing (and subsequently provide documentation of the results) prior to the final design and following the completion of the system.
E. Installation must meet all applicable code requirements including but not limited to:
   a. NFPA72
   b. IFC
   c. NEC
F. System shall have full (parts and labor) 12 month warranty including any software upgrades or subscriptions during the warranty period from the date of final acceptance. This shall include any additional testing or modifications required for system functionality based on the original design scope of work.
G. System Training: Provide a minimum of 16 hours of Owner training. This shall include familiarizing the Owner with locations, functions, and operability. Document training.

END OF SECTION 28 05 37

SECTION 283100 FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes fire alarm systems.

B. The existing fire alarm control panel shall be replaced with a new panel as specified herein. All existing fire alarm initiation, notification, and other types of devices currently installed in the existing building shall be removed and a system of new devices as manufactured by the new FACP supplier. Existing wiring that is compatible with the new system may be re-used if serviceable and compliant with current codes. Install any new wiring as required to provide a complete, unified fully functional system that complies with all requirements of the Nation Fire Protection Association (NFPA) and the National Electrical codes

C. The building is classified as "High Rise". Provide all related devices as required (emergency voice/alarm communication, fireman control room devices, firefighter telephone system, mass notification, etc.).

1.3 DEFINITIONS

A. FACP: Fire alarm control panel.

B. LED: Light-emitting diode.

C. NICET: National Institute for Certification in Engineering Technologies.

D. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.4 SYSTEM DESCRIPTION

A. Non-coded, addressable system; multiplexed signal transmission dedicated to fire alarm service only (provided by the owner).

1.5 PERFORMANCE REQUIREMENTS

A. Comply with NFPA 72.

B. Fire alarm signal initiation shall be by one or more of the following devices:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Automatic sprinkler system water flow.
5. Fire extinguishing system operation.
6. Fire standpipe system.

C. Fire alarm signal shall initiate the following actions:

1. Alarm notification appliances shall operate continuously.
2. Identify alarm at the FACP and remote annunciators.
3. De-energize electromagnetic door holders.
4. Transmit an alarm signal to the remote alarm receiving station.
5. Release fire and smoke doors held open by magnetic door holders.
6. Switch heating, ventilating, and air-conditioning equipment controls to fire alarm mode.
7. Close smoke dampers in air ducts of system serving zone where alarm was initiated.
8. Record events in the system memory.

D. Supervisory signal initiation shall be by one or more of the following devices or actions:

1. Operation of a fire-protection system valve tamper switch.

E. System trouble signal initiation shall be by one or more of the following devices or actions:

1. Open circuits, shorts and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.
2. Opening, tampering, or removal of alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at the FACP.
4. Ground or a single break in FACP internal circuits.
5. Abnormal ac voltage at the FACP.
6. A break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at the FACP or annunciator.
9. Low-air-pressure switch operation on a dry-pipe or pre-action sprinkler system.

F. System Trouble and Supervisory Signal Actions: Ring trouble bell and annunciate at the FACP and remote annunciators.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Shop Drawings shall be prepared by persons with the following qualifications:

a. Trained and certified by manufacturer in fire alarm system design.
b. Fire alarm certified by NICET, minimum Level III.

2. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
3. Device Address List: Coordinate with final system programming.
4. System riser diagram with device addresses, conduit sizes, and cable and wire types and sizes.
5. Wiring Diagrams: Power, signal, and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show wiring color code.
6. Batteries: Size calculations.

7. Duct Smoke Detectors: Performance parameters and installation details for each detector, verifying that each detector is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
8. Ductwork Coordination Drawings: Plans, sections, and elevations of ducts, drawn to scale and coordinating the installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, the detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
9. Floor Plans: Indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.
10. Coordinate with sprinkler contractor to provide connection to all flow and tamper switches, low air signals, zone control valves, etc.

C. Qualification Data: For Installer.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For fire alarm system to include in emergency, operation, and maintenance manuals. Comply with NFPA 72, Appendix "A", recommendations for Owner's manual. Include abbreviated operating instructions for mounting at the FACP.

F. Documentation:

1. Approval and Acceptance: Provide the "Record of Completion" form according to NFPA 72 to Owner, Architect, and authorities having jurisdiction.
2. Record of Completion Documents: Provide the "Permanent Records" according to NFPA 72 to Owner, Architect, and authorities having jurisdiction. Format of the written sequence of operation shall be the optional input/output matrix.

    a. Hard copies on paper to Owner.
    b. Electronic media may be provided to Architect and authorities having jurisdiction.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but not less than 1 unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but not less than 1 unit.
3. Smoke, Fire, and Flame Detectors: Quantity equal to 10 percent of amount of each type installed, but not less than 1 unit of each type.
4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but not less than 1 unit of each type.
5. Keys and Tools: One extra set for access to locked and tamper proofed components.
6. Audible and Visual Notification Appliances: TEN of each type installed.
7. Fuses: Two of each type installed in the system.
8. Pull Stations: Quantity of five.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following manufacturer:

1. FACP and Equipment:

a. System shall be fully integrated and compatible with the system in the Detention Center- Simplex Grinnell, 4100ES.

b. Prior Approved Equal

2. Wire and Cable:

a. Belden.
b. West Penn Wire/CDT; a division of Cable Design Technologies.

2.2 MANUAL FIRE ALARM BOXES

A. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. Mounted on recessed outlet box; if indicated as surface mounted, provide manufacturer's surface back box.
1. Double-action mechanism requiring two actions to initiate an alarm, breaking-glass or plastic-rod type. With integral addressable module, arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.
2. Station Reset: Key- or wrench-operated switch.
3. Indoor Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.

2.3 SYSTEM SMOKE DETECTORS

A. General Description:

1. UL 268 listed, operating at 24-V dc, nominal.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
3. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection of building wiring.
4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
5. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status.

B. Photo-electric Smoke Detector:

1. Sensor: Responsive to visible products of combustion. Self-compensating for changes in environmental conditions.
2. Detector Sensitivity: Between 0.5 and 1.7 percent/foot (0.0016 and 0.0056 percent/mm) smoke obscuration when tested according to UL 268A.

C. Duct Smoke Detectors:

1. Photo-electric Detectors:

a. Sensor: Responsive to visible products of combustion. Self-compensating for changes in environmental conditions.
b. Detector Sensitivity: Between 0.5 and 1.7 percent/foot (0.0016 and 0.0056 percent/mm) smoke obscuration when tested according to UL 268A.

2. UL 268A listed, operating at 24-V dc, nominal.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
4. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status. Provide remote status, alarm indicator and test stations where detectors are located above accessible ceilings.
7. Each sensor shall have multiple levels of detection sensitivity.
8. Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.
9. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.4 HEAT DETECTORS

A. General: UL 521 listed.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or rate-of-rise of temperature that exceeds 15 deg F (8 deg C) per minute, unless otherwise indicated.

1. Mounting: Plug-in base, interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

2.5 NOTIFICATION APPLIANCES

A. Description: Equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.

B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn.

C. Visible Alarm Devices: Xenon strobe lights listed under UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output: As required by NFPA for area to be covered; 75 candela minimum to comply with ADA requirements.
2. Strobe Leads: Factory connected to screw terminals.

2.6 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching door plate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf (111-N) holding force.
2. Wall-Mounted Units: Flush mounted, unless otherwise indicated.
3. Rating: To match modules in FACP equipment.

B. Material and Finish: Match door hardware.

2.7 WIRE AND CABLE

A. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with NFPA 70, Article 760.

B. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70 Article 760, Classification CI, for power-limited fire alarm signal service. UL listed as Type FPL, and complying with requirements in UL 1424 and in UL 2196 for a 2-hour rating.

C. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. The electrical contractor shall furnish all duct smoke detectors with sampling tubes that extend the full width of the duct. The mechanical contractor will be responsible for the installation of duct smoke detectors into the duct system. Electrical connection of the duct smoke detector to the fire alarm system shall be by the electrical contractor. Control wiring and connections for mechanical equipment shut down shall be by the mechanical contractor.

B. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

C. Audible Alarm-Indicating Devices: To comply with ADA requirements, install at 80" above finish floor or 6 inches (150 mm) below the ceiling (whichever is lower). Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

Coordinate mounting height in areas with wall tile such as group toilets to make sure devices are place entirely within the tile finish or entirely above the tile finish.

D. Visible Alarm-Indicating Devices: To comply with ADA requirements, install at 80" above finish floor or 6 inches (150 mm) below the ceiling (whichever is lower). Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Coordinate mounting height in areas with wall tile such as group toilets to make sure devices are place entirely within the tile finish or entirely above the tile finish.

E. Annunciator: Flush mounted. Install with top of panel not more than 72 inches (1830 mm) above the finished floor.

3.2 WIRING INSTALLATION

A. Install wiring according to the following:

1. NECA 1.
2. TIA/EIA 568-A.

B. Wiring Method: Install wiring in metal raceways from boxes within walls to a point above the ceiling according to Division 26 "Raceway and Fittings".

1. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed above accessible ceilings without conduit. Where installed in this manner, all cabling shall be supported as required by the National Electrical Code. Provide plenum rated cabling where installed above ceilings used for return of environmental air. All fire alarm cabling shall be color coded (red in color).
2. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
3. Where cabling is required to cross areas which have non-accessible ceilings, provide conduits (sized as required) for cable routing through the non-accessible area.
4. In areas where cabling will be exposed such as mechanical rooms, electrical rooms, etc., all cabling must be installed in conduits.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

F. Install instructions frame in a location visible from the FACP.

G. Note that all Companies submitting a bid for the fire alarm system shall agree to provide programming software to the Owner. The fire alarm contractor or equipment manufacturer shall also agree that all parts, either for replacement or upgrades, can be purchased by the Owner directly from the manufacturer and will not require a third party dealership for programming or parts.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Before requesting final approval of the installation, submit a written statement using the form for Record of Completion shown in NFPA 72.
2. Perform each electrical test and visual and mechanical inspection listed in NFPA 72. Certify compliance with test parameters.

    a. Include the existing system in tests and inspections.

3. Visual Inspection: Conduct a visual inspection before any testing. Use as-built drawings and system documentation for the inspection. Identify improperly located, damaged, or nonfunctional equipment, and correct before beginning tests.
4. Testing: Follow procedure and record results complying with requirements in NFPA 72.

    a. Detectors that are outside their marked sensitivity range shall be replaced.

5. Test and Inspection Records: Prepare according to NFPA 72, including demonstration of sequences of operation by using the matrix-style form in Appendix A in NFPA 70.

3.4 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.

B. Follow-Up Tests and Inspections: After date of Substantial Completion, test the fire alarm system complying with testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for three monthly, and one quarterly, periods.

C. Semiannual Test and Inspection: Six months after date of Substantial Completion, test the fire alarm system complying with the testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

D. Annual Test and Inspection: One year after date of Substantial Completion, test the fire alarm system complying with the testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for monthly, quarterly, semiannual, and annual periods. Use forms developed for initial tests and inspections.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the fire alarm system, appliances, and devices.

END OF SECTION 283100

SECTION 31 10 00
SITE CLEARING AND STRIPPING

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Site Demolition (Section 02 22 00).
2. Erosion and Sedimentation Control (Section 31 25 00).
3. Earthwork (Section 31 20 00).
4. Excavation and backfilling for plumbing and mechanical work (Division 23).
5. Excavation and backfilling for electrical work (Division 26).

B. Work Included This Section:

1. Protection of existing trees to remain.
2. Removal of trees, shrubs and other vegetation.
3. Clearing and grubbing.
4. Stripping of both suitable and unsuitable topsoil down to subsoil.
5. Removing above-grade improvements.
6. Removing below-grade improvements.

1.3 EXISTING CONDITIONS:

A. Site Conditions: Existing conditions are shown in general on the Drawings. Contractor shall visit the site, familiarize himself with actual conditions and verify existing conditions in the field.

B. Acceptance: The Contractor is required to accept actual conditions at the site, and to perform the work specified or shown without additional compensation for possible variation from grades and conditions shown, whether surface or subsurface, except as specifically provided for by the Contract Documents.

C. Record Information: Survey maps, subsurface soil report and other recorded site information may be examined at the office of the Architect.

1.4 PROJECT CONDITIONS:

A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

B. Protection of Existing Improvements: Provide protection necessary to prevent damage to existing improvements indicated to remain in place.

1. Protect improvements on adjoining properties and on Owner's property.

2. Restore damaged improvements to their original condition, as acceptable to property owners.

C. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to remain.

1. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.

2. Provide protection for roots over 1 1/2-inch diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

3. Repair or replace trees and vegetation indicated to remain which are damaged by construction operations, in a manner acceptable to Architect. Employ a licensed arborist to repair damages to trees and shrubs.

4. Replace trees which cannot be repaired and restored to full-growth status, as determined by arborist.

D. Salvable Items: Carefully remove items indicated to be salvaged, and store on Owner's premises where indicated or directed.

1.5 PROTECTION:

A. Bench Marks: Maintain carefully all bench marks, monuments and other reference points. If disturbed or destroyed, replace as directed by the Architect.

B. Existing Utilities: Should any functioning underground utilities be uncovered during the work; the Contractor shall notify the Architect promptly in writing. The Contractor shall be held responsible for any damage to underground or overhead utility lines and shall promptly repair and restore services in accordance with requirements of authority having jurisdiction at no additional cost to the Owner.

PART 2: PRODUCTS

2.1 FILL MATERIAL for depressions left by removed stumps or other clearing work shall be as specified in Section 31 20 00.

PART 3: EXECUTION

3.1 SITE CLEARING:

A. General: Remove trees, shrubs, grass and other vegetation, improvements, or obstructions as required to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. "Removal" includes digging out (or grinding where permitted by the drawings) and off-site disposing of stumps and roots.

1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner, where such roots and branches obstruct installation of new construction.

B. Suitable Topsoil: Friable clay loam surface soil found in a depth of not less than 4 inches. Suitable topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material.

1. Strip suitable topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.

    a. Remove heavy growths of grass from areas before stripping.

    b. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.

2. Stockpile suitable topsoil in storage piles in areas indicated or directed. Construct storage piles to provide free drainage of surface water. Cover storage piles, if required, to prevent wind erosion.

3. Dispose of excess suitable topsoil same as specified for disposal of waste material or unsuitable topsoil.

C. Unsuitable Topsoil: Surface soil that does not qualify as suitable topsoil but exhibits some of the characteristics of topsoil, such as containing organic matter, and is located above subsoil.

1. Strip unsuitable topsoil to whatever depths encountered down to subsoil.

2. Dispose of unsuitable topsoil as specified hereinafter.

D. Completion of topsoil stripping (suitable and unsuitable) shall result in all areas that are to be graded, including both cut and fill areas, being completely stripped of all topsoil down to the underlying subsoil.

E. Clearing and Grubbing: Clear site of trees, shrubs and other vegetation, except for those indicated to remain.

1. Completely remove stumps, roots and other debris protruding through ground surface.

2. Use only hand method for grubbing inside drip line of trees indicated to remain.

3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

    a. Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact to a density equal to adjacent original ground.

F. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.

1. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings and is included under work of related Division 23 and 26 Sections. Removal of other abandoned underground piping or conduit interfering with construction is included under this Section.

3.2 DISPOSAL OF WASTE MATERIALS:

A. Burning on Owner's Property: Burning is not permitted on Owner's property.

B. Removal from Owner's Property: Remove waste materials and unsuitable or excess topsoil from Owner's property.

END OF SECTION 31 10 00

SECTION 31 20 00
EARTHWORK

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Site Clearing and Stripping (Section 31 10 00).
2. Quantity allowances regarding rock and unsuitable soil removal (Section 01 21 00).
3. Erosion and Sedimentation Control (Section 31 25 00).
4. Site Demolition (Section 02 22 00).
5. Excavation and backfilling for plumbing and mechanical work (Division 22 &23).
6. Excavation and backfilling for electrical work (Division 26).
7. Lawns, Grass and Landscape work (See Drawings).

B. Work Included This Section:

1. Grading and preparation of required subgrades.
2. Excavating and backfilling for buildings and structures.
3. Excavating and backfilling of trenches under building and within 5' of building perimeter, except plumbing, mechanical and electrical trenches are specified in Divisions 22, 23 and 26.
4. Drainage fill course for support of building slabs.
5. Distribution of stockpiled topsoil on all grassed and landscaped areas. When on-site topsoil is not sufficient to provide a 4" depth on all areas to be grassed or landscaped, topsoil shall be provided from off-site borrows.

1.3 SUBMITTALS:

A. Compaction Equipment:

1. Submit (for information only) list of compaction equipment proposed for use for overlot grading. Show weights, consolidation devices on equipment.

2. Submit (for information only) type of compaction equipment proposed for confined areas. Show weight, vibration frequency and stroke, and size of foot.

B. Grading Equipment:

1. Submit (for information only) description of proposed grading equipment.

1.4 REFERENCE STANDARDS:

A. Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

The American Society for Testing and Materials (ASTM)

1.5 COMPACTION STANDARDS: Required densities of compaction are expressed hereinafter in terms of percentages. Such terms shall mean percentages of maximum density at optimum moisture content, as determined and controlled in accordance with Standard Proctor Method, ASTM D 698.

1.6 FIELD TESTING:

A. Test will be made by testing laboratory selected by the Owner. All tests will be paid for by the Owner except retesting made necessary by failed tests shall be paid for by the Contractor.

B. Perform one compaction test for each 5,000 sq. ft. of fill for each lift.

C. See Section 01 41 00 and Section 01 45 00 regarding notification of the testing lab and other testing requirements.

1.7 EXISTING CONDITIONS:

A. Site Conditions: Existing conditions are shown in general on the Drawings. Contractor shall visit the site, familiarize himself with actual conditions and verify existing conditions in the field.

B. Acceptance: The Contractor is required to accept actual conditions at the site, and to perform the work specified without additional compensation for possible variation from grades and conditions shown, whether surface or subsurface, except as provided for by the Contract Documents.

1.8 PROTECTION:

A. Bench Marks and Monuments: Maintain carefully all bench marks, monuments and other reference points. If disturbed or destroyed, replace as directed. If found at variance with the Drawings, notify the Architect before proceeding to layout work.

B. Protection of Existing Work Remaining: All existing curbs, sidewalks, and paving damaged in performance of this work shall be restored without extra cost to the Owner in the manner prescribed by authorities having jurisdiction.

1.9 DISPOSITION OF UTILITIES:

A. Rules and Regulations of the authority having jurisdiction shall be followed in executing all work under this Section.

B. Active Utilities shown on the Drawings shall be adequately protected from damage and removed or relocated only as indicated or specified. Where active utilities are encountered, but are not shown on the Drawings, the Architect shall be advised. The work shall be adequately protected, supported, or relocated as directed. If the utility is not shown on the Drawings and has to be relocated, this work will be done by Change Order and extra pay to the Contractor as described in Changes In The Work provisions of the General Conditions.

C. Inactive and Abandoned Utilities encountered in excavating and grading operations shall be removed, plugged or capped as directed. In the absence of specific requirements, plug or cap such utility lines at least 3' outside of new building walls, or as required by local authorities.

1.10 UNSUITABLE SOIL REMOVAL:

A. Unsuitable Soil: (See Section 01 21 00 for quantity allowances included in Base Bid for unsuitable soil removal).

1. Definition: The Architect in conjunction with recommendations of the Soils Technician will be the final judge as to what is to be classified as unsuitable soil material (soft subgrade, organic material, etc.).

2. Measurement: No credit will be given, or payment made for removal of unsuitable material unless classified as such by the Architect and Soils Technician and authorized to be removed and measured by the Architect and Soils Technician.

3. Notification of Architect: If unsuitable soil is encountered and must be removed in a quantity more than or less than the quantity to be included in the Contractor's Base Bid, the Contract Price will be adjusted in compliance with the General and Supplementary General Conditions based on unit prices submitted with the Project Bid.

1.11 RELOCATION OF UTILITIES: If utility lines require relocation and are not so indicated or noted on the Drawings, the Contract Price will be adjusted for such additional work in compliance with provisions of the General and Supplementary General Conditions.

1.12 EROSION CONTROL:

A. The Contractor shall provide and maintain erosion, sedimentation and storm water controls to comply with Federal, State and local ordinances as they apply to this Contract. This shall include, but not be limited to, the erosion control devices shown on the Drawings. See Section 31 25 00 for additional requirements regarding erosion control.

PART 2: PRODUCTS

2.1 MATERIALS:

A. Topsoil:

1. When on-site topsoil is not sufficient to provide a 4" depth on all areas to be grassed or landscaped, topsoil shall be provided from off-site borrows. Borrow topsoil shall be loose soil, consisting of a friable mixture of clay, silt, and sand, with a varying content of fine, friable organic matter. Topsoil shall be free of roots, stones, debris, clay and other materials to an extent detrimental to lawn installation and maintenance.

B. Unsuitable and Surplus Material: Remove unsuitable material and surplus excavated material from the site.

C. Fill Material:

1. Material for fill shall be clean earth free from roots, wood or other organic material or any other material that would decompose by rusting, rotting, or otherwise and shall have a minimum unit weight of 90 pcf and a maximum plasticity index (PI) of 15.

2. Earth used for structural fill, fill under floor slabs and other paved areas shall be approved by laboratory test by the testing laboratory employed for the Project.

3. Stones larger than 4" maximum dimension shall not be used in the upper 12" of fill or embankment.

D. Subbase Materials: For pavement outside the building, provide naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, and natural or crushed sand.

E. Drainage Fill: For concrete slabs on grade inside the building, provide clean, washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100% passing a 1 1/2" sieve and not more than 5% passing a No. 4 sieve.

F. Borrow Fill: Use suitable excavated materials for required fills and backfills. Provide any additional fill material from off the site as necessary to produce the required grades at no

additional cost to the Owner. Borrow fill is subject to testing and approval of the Owner's Testing Laboratory.

PART 3: EXECUTION

3.1 PREPARATION:

A. Layout: Grade and layout stakes shall be provided and maintained as required. The building, drives, walks, and other site improvements shall be staked. Layout work shall be referenced to bench marks, base lines, property lines, easements and/or rights-of-way as indicated.

B. Verification of Work: Where new grades tie into existing grades, existing grades shall be verified. If existing conditions are at variance with the Drawings, the Architect shall be notified before proceeding with the work and adjustments made only as directed by the Architect.

3.2 SITE GRADING PROVISIONS:

A. Grades: Do all cutting, filling, compacting of fills, and grading required to bring the entire Project Area to subgrades as follows:

1. For lawn and planted areas to receive topsoil, to 4" below finished grade.

2. For areas under walks, pavement, pads, footings and other surfaced areas, bring to subgrade according to sections shown on the Drawings.

B. Rock Excavation: When rock is encountered in grading the areas outside of buildings, it shall be removed to depths as follows:

1. Under paved areas, to underside of the respective subgrade for such areas.

2. Under lawn and planted areas and under buildings, to 2'-0" below finished grade, except that boulder of protruding rock outcrops where so indicated by the Architect shall be left undisturbed.

3. Provisions regarding rock excavation hereinbefore set forth in paragraph titled "Unsuitable Soil Removal" (in Part 1 of this Section) shall apply. Areas of rock excavation shall be backfilled to subgrade level with earth compacted in place.

4. Blasting shall not be allowed.

3.3 GRADING:

A. Grade all required areas within the limits of work, including excavated and filled sections and adjacent transition areas.

B. After grading, and before any filling, proofroll areas to receive structural fill as hereinafter specified. Proofroll cut (non-fill) areas beneath the building and pavement.

C. Grading shall produce reasonably smooth, compacted surfaces free from irregular changes. Provide roundings at top and bottom of banks and at other breaks in grade.

D. Degree of finish shall be that ordinarily obtainable from either blade-grader or scraper operations, except as specified otherwise.

E. If excavations are carried by the Contractor below the indicated or specified levels, without proper authorization, they shall be refilled to the required levels with compacted fill as hereinafter specified.

F. Tolerances: The finished subgrade surface generally shall not be more than 0.2' above or below the established grade or approved cross section, with due allowance for topsoil, sod and other landscape material depths; the tolerance for areas within 10' of buildings and all areas to be paved shall not exceed 0.15' above or below the established subgrade.

G. Drainage: Contractor shall control the grading around buildings so that ground is pitched to prevent water from running into the excavated areas or damaging the structures. Unless otherwise indicated, the subgrade shall be evenly sloped to provide drainage away from building walls in all directions at a slope not less than 1/4" per foot. Maintain all pits and trenches, where footings are to be placed, free of water at all times. Provide all pumping required to keep excavated spaces clear of water during construction. Should any springs or running water be encountered in the excavation, the Architect shall be notified, and the Contractor shall provide discharge of it by trenches or pumping and drain to an appropriate point of disposal as directed. If permanent provision, not shown on the Drawings or specified, must be made for disposal of water, the Contract Price will be adjusted.

H. Frost Protection: When freezing temperatures are expected, do not excavate to the full depth indicated, unless the pavements, footings or other construction can be placed immediately after the excavation has been completed. Protect the excavated bottoms from frost if placing of concrete is delayed.

3.4 PROOFROLLING:

A. After the existing earth is graded, before placing any fill or construction, the excavated surface shall be proofrolled with a 25-ton loaded dump truck to its maximum density. A minimum of two passes of the truck shall be made in each direction. This operation shall be witnessed by the soils inspector. Any areas that yield excessively, or that will not compact during this proofrolling, shall be undercut and new fill placed and compacted as specified and directed by the soils inspector.

3.5 EXCAVATION FOR BUILDINGS AND STRUCTURES:

A. Dimensions: Excavate to elevations and dimensions indicated. Allow additional space as required for construction operations and inspecting foundations.

3.6 FILLS:

A. Where fill is required to raise the subgrade for concrete floor or exterior slabs to the elevation indicated, such fills shall be of earth, placed and compacted as specified. The finished compacted areas shall be brought to a reasonably true and even plane at the required elevations. The placing and compaction of fill under slabs after foundation walls are in place shall be coordinated with the backfilling against the outside of the walls, or walls shall be adequately braced to prevent damage.

B. Where fill is required to raise the existing grades to new subgrade elevation indicated or required, such fill shall be clean earth, placed and compacted as specified.

C. Remove all material subject to termite attack, rot or corrosion, and all other deleterious materials from areas to be filled. Prior to placing fill material, the surface of the ground shall be scarified to a depth of 6" and the moisture content of the loosened material shall be such that it will readily bond with the first layer of fill material.

D. Where structural fill is required to raise the subgrade for the support of building footings, fill material shall be as specified hereinbefore.

E. Where fill is required to raise existing grades outside of building area and outside area requiring structural fill to the new subgrade elevation indicated, such fill shall be earth, placed and compacted as specified.

3.7 PLACING OF FILL:

A. Surface Preparation: Before depositing fill, remove all topsoil, vegetation, and other unsuitable material from areas to receive fill. In no case shall fill be placed on a subgrade that is muddy, frozen, or that contains frost.

B. Fill material shall be placed only on surfaces approved by the testing laboratory.

C. Placement:

1. Place the material in successive horizontal layers not exceeding 8" for the full width of the cross section.

2. Deposit fill in layers not more than 6" thick in small areas where high-frequency vibratory tamper must be used in lieu of large rolling equipment.

3. Deposit fill in layers not more than 1'-0" thick under lawn and landscaped areas.

4. Fill shall be placed only when it is within 3% of its optimum moisture content as determined by a Standard Proctor ASTM D 698.

5. Each layer of fill shall be spread evenly and shall be compacted to its specified density as determined by Standard Proctor ASTM D 698 before new layers are placed and compacted.

D. Compaction:

1. Structural Fill Under Buildings and Within 10' of Building Perimeter: 100% of Standard Proctor the entire depth of fill.

2. Under Walks, Drives, Pads, and Paved Areas: 95% of Standard Proctor except 100% of Standard Proctor in the upper 2'.

3. Under Lawns and Planting Areas Beyond 10' from Building: Compaction obtained by routing spreading equipment over the area.

4. Where these compaction requirements are different from requirements specified elsewhere or shown on the drawings the more stringent requirements shall apply.

3.8 BACKFILLING FOR BUILDINGS AND STRUCTURES:

A. Preparation: Before placing backfill, remove all material subject to termite attack, rot or corrosion, and all other deleterious materials from areas to be backfilled. All backfill material shall be free from roots, plaster, brick bats and unsuitable material.

B. Stones larger than 4" maximum dimension shall not be permitted in the upper 12" of backfill. Place the backfill material in successive horizontal layers, in loose depth as specified, for the full width of the cross section. Deposit backfill in layers not more than 8" thick. Thoroughly compact each layer by rolling or pneumatic tamping after a light sprinkling with water.

C. Foundation Walls:

1. Backfill against foundation walls only after walls have been supported either by bracing or after the floors have been installed to support top and bottom of the wall.

2. Place and compact backfill so as to minimize settlement and to avoid damage to walls, to waterproofing, and to other work in place.

D. Finish: The finished subgrade shall be brought to elevations indicated and sloped to drain water away from the building walls. Fill to required elevations any areas where settlement occurs.

E. Compaction: All backfill under and within 10' of building shall be compacted to 100% of Standard Proctor. In case of settlement, provide additional fill to bring grade to that required.

3.9 FOOTINGS ON STRUCTURAL FILL:

A. Material Type: Where structural fill is required to raise the subgrade for the support of building footings, fill material shall be as hereinbefore specified.

B. Compaction for structural fill shall be 100% of Standard Proctor.

C. Limits: Structural fills shall be provided under the entire building and to a line 10'-0" beyond the building perimeter.

D. Excavation: Excavate in the structural fill for building footings as hereinbefore specified under "Excavation for Buildings and Structures".

3.10 BACKFILL IN TRENCHES:

A. Take precautions in backfilling to prevent disalignment of pipe or structures.

B. Compact approved fill material firmly and evenly on both sides of pipe. Fill remainder of trench in 6" layers and compact each layer with a vibratory tamper as specified elsewhere in this Section for the particular location of the backfill.

C. Comply with compaction requirements elsewhere in this Section for the area through which the trench runs. Where no requirement has been established, compact fill material to 95% maximum density at optimum moisture content.

3.11 PAVEMENT SUBBASE COURSE:

A. General: Subbase course consists of placing subbase material, in layers of specified thickness, over subgrade surface to support a pavement base course.

1. Refer to other Division 2 Sections for paving specifications.

B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.

C. Shoulders: Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders of acceptable soil materials placed in such quantity to compact to thickness of each subbase course layer. Compact and roll at least a 12" width of shoulder simultaneous with the compaction and rolling of each layer of subbase course.

D. Placing: Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.

1. When a compacted subbase course is indicated to be 6" thick or less, place material in a single layer. When indicated to be more than 6" thick, place material in equal layers, except no singled layer more than 6" or less than 3" thickness when compacted.

3.12 BUILDING SLAB DRAINAGE COURSE:

A. General: Drainage course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs.

B. Placing: Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.

1. In each compacted fill layer, perform one field density test for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case fewer than three tests.

2. Foundation Wall Backfill: Perform at least two field density tests at locations and elevations as directed.

3. If in opinion of Architect, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, perform additional compaction and testing until specified density is obtained.

3.13 DISTRIBUTION OF TOPSOIL:

A. Spread stored topsoil over graded areas to be grassed or landscaped as shown on Drawings.

B. After topsoil is spread, remove all hard lumps of clay, stones over 1" in diameter, roots, limbs, and other deleterious matter which would be harmful or prevent proper establishment and/or maintenance of lawn and planting areas.

C. If suitable topsoil stockpiled is inadequate to provide 4" depth, suitable topsoil, as specified hereinbefore, shall be provided from off-site sources by the Contractor at no additional cost to the Owner.

END OF SECTION 31 20 00

SECTION 31 25 00
EROSION AND SEDIMENTATION CONTROL

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Earthwork (Section 31 20 00).

B. Work Included This Section:

1. Protection of the project area and surroundings from soil erosion, runoff, sedimentation or the effects of harmful waste discharges resulting from construction operations.

2. Installation and maintenance of erosion control devices and structures and temporary seeding of disturbed areas. See Landscape Drawings for permanent seeding.

3. It is the responsibility of the Contractor to provide all erosion control construction required in order to comply with local and state regulations, even if not specifically shown on the Drawings or specified herein.

1.3 QUALITY ASSURANCE:

A. General: Employ only experienced personnel familiar with required work. Provide adequate supervision by qualified foreman.

B. Codes and Standards: Comply with applicable North Carolina Administrative Code, Title 15, Chapter 4, "Sedimentation Control" (15 NCAC4), and City of Raleigh "Erosion and Sedimentation Control Ordinance".

PART 2: PRODUCTS

2.1 MATERIAL:

A. Temporary Silt Fence: Provide as per NCDOT Standard Section 893, or equivalent materials.

1. Posts: Provide either wood (3" diameter or greater x 6' long) or steel (1 3/4" wide, self- or fastener-angle type, 5' long) posts at Contractor's option.

2. Fence Fabric: Galvanized steel wire; 32-inch overall height with at least 6 horizontal line wires; vertical stay wires spaced 12 inches apart; top and bottom wires 10 gauge, all other wire 12 1/2 gauge.

3. Filter Fabric: 36-inch-wide fabric; burlap, 6.7 oz./sq. yd., or Dominion Textile Corporation "Mirafi 100X" or equivalent.

B. Baled Hay Barriers: Small grain straw or tame hay, compacted in bales with wire ties, approximate dimensions 24" x 48" x 24", weighing minimum 45 lbs. per bale, air dried free of undesirable weed seed.

C. Erosion Control Blankets: Provide either AMXCO Curlex Blankets or AMXCO Hi-Velocity Curlex Blankets by American Excelsior Company, Arlington, Tx, or approved equal, as necessary to control erosion, depending upon steepness of the slope and velocity of storm water down the slope.

1. AMXCO Curlex Blanket is a machine produced mat of curled wood excelsior of 80% six-inch or longer fiber length and of consistent thickness with the fiber mat evenly distributed over the entire area of the blanket. The top surface of the blanket is covered with a photogradeable extruded plastic mesh.

2. AMXCO Hi-Velocity Curlex Blanket is the same as the AMXCO Curlex Blanket except is thicker and both sides are covered with extra heavy duty extruded plastic mesh.

3. Wire staples for AMXCO Curlex Blanket are to be .091" minimum in diameter, U-shaped with 6" legs and 1" minimum crown.

4. Wire staples for AMXCO Hi-Velocity Curlex Blanket are to be .091" minimum in diameter, U-shaped with 8" legs and 1" to 2" crown.

D. Seeds for Temporary Ground Cover: Labeled to show they are within the requirements of the N.C. Department of Agriculture as to purity, germination, and the restriction of prohibited weed seeds. Use seed certified to have a minimum purity of 95% and to have passed a germination test of 90% with total weed seed in mixture not exceeding 1%.

1. Temporary Seeding Schedule:

Plants & Mixtures	Planting Rates/Acre	Planting Dates
Tall Fescue	80-150 lbs/acre	Aug. 15 - Oct. 15
Tall Fescue & Sericca Lespedeza	75 lbs/acre 60 lbs/acre	Feb. 15 - Apr. 30 Sc. Nov. 1 - Feb. Unscar
Tall Fescue & Browntop Millet or Sorghum - Sudan Hybrids	60 lbs/acre 30 lbs/acre (Millet & Sorghum must be kept at 10" max. height)	July - August
Tall Fescue & Ryegrain (Keep annuals cut to 10")	70 lbs/acre 25 lbs/acre	Nov. 1 - Jan.
Weeping Lovegrass	5 lbs/acre	April - June
Common Bernudagrass	8-12 lbs/acre (hulled) 15-20 lbs/acre (unhulled)	April 15 - June 30 Feb. 1 - March

2. Permanent Seeding: As shown on the drawings.

E. Mulch: Small Grain straw or tame hay to be applied at 75 to 100 lbs/1000 sq. ft. or 1 1/2 tons/acre.

F. Emulsified Asphalt: Suitable for application using liquid applicator on power mulch blower or other suitable equipment at the rate of 200 qa./ton of straw.

G. Plain Rip Rap: NCDOT Article 942-1, Class 1 (5 - 200 lb. d 50=8"). More than 50% of the mixture shall be larger than the d50 stone size indicated.

PART 3: EXECUTION

3.1 GENERAL:

A. The construction sequence and scheduling of construction operations shall be an integral part of the control plan. Establish a sequence of operations that will facilitate the control of erosion:

B. Limit initiation of work to the minimum area necessary to prosecute work, leaving soil cover on other areas undisturbed.

C. Complete work on individual areas as quickly as possible to permit installation of planned temporary and permanent erosion control measures.

D. Whenever land-disturbing activity is undertaken, plant a ground cover sufficient to restrain erosion or otherwise protect that portion of the site upon which further active construction is not being undertaken.

E. Silt Basins: Silt basins, diversions and other earthwork shall be constructed in accordance with sections of the specification under Earthwork.

F. Silt Fences: Set posts not more than 10 feet apart. Attach fabric to posts with bottom at or just below grade.

1. Attach filter fabric to fence and leave 6-inch skirt at bottom. Cover filter fabric skirt with compacted backfill to prevent water from washing under fence.

2. Install silt fence around each drain inlet, as new roadside swale filters on 200' intervals, and along downhill side(s) of site.

G. Erosion Control Blankets: Placement of the blankets and anchoring down with wire staples shall be in accordance with published recommendations of the erosion control blanket manufacturer.

3.2 SITE GRADING OPERATION:

A. Do not commence construction work until immediate and temporary soil erosion measures are installed. These temporary measures are to be installed as detailed on the approved Erosion and Sedimentation Control Plan.

B. Temporary Ground Cover: Areas which will stand for over 30 days at temporary grade elevations shall be seeded with a temporary grass seed cover applied within 30 days of completing the rough grading operations.

C. Areas which become eroded or do not have 75% minimum coverage of healthy grass or reveal bare spots shall be reseeded, or remulched, or renetted and watered such that the entire planted controlled erosion area contains a healthy and temporary stand of grass during the construction period.

D. Permanent Ground Cover: On all ground areas that are graded to final elevations, permanent ground cover shall be established within 15 days of completing the rough grading of that area. Any temporary ground covers that exist on interim ground surfaces shall be removed prior to continuing with finish grading to prevent an undesirable mix of grass types for final grass areas. Overseeding will not be allowed since most temporary ground covers are very hardy types and will crowd out or overshadow the finer permanent ground covers.

3.3 MAINTENANCE:

A. Relocate, repair, clean out and perform any other operation necessary to maintain protective devices in effective operating condition at least once per month during construction period.

3.4 CLEANUP:

A. Remove all temporary devices and cover as their presence becomes no longer required.

END OF SECTION 31 25 00

SECTION 32 13 00
CONCRETE WALKS, STEPS AND PAVING

PART 1: GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Metal handrails (Section 05 50 00).
2. Abrasive nosings (Section 05 50 00).
3. Sealants (Section 07 90 00).

B. Work Included This Section:

1. Concrete walks.
2. Concrete steps.
3. Concrete paving, including pads for mechanical and electrical equipment as shown on the Drawings.
4. All accessories required for a complete and proper installation.

1.3 INDUSTRY STANDARDS:

A. Reference: Some products and execution are specified in this Section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the referenced standard.

The American Society for Testing and Materials (ASTM)

PART 2: PRODUCTS

2.1 MATERIALS:

A. Reinforcement:

1. Reinforcing Bars: Deformed bars conforming to ASTM A 615, Grade 60, size and spacing shown on the Drawings.

2. Welded Wire Fabric: ASTM A 185, size and gauge shown on the Drawings and if not shown on the Drawings provide 6" x 6" mesh with 9-gauge wire in both directions.

B. Concrete: Standard weight, ready-mixed concrete conforming to ASTM C 94. Maximum size aggregate of 1". Maximum slump of 4". Minimum compressive strength at 28 days, 3,000 psi. Concrete shall comply with requirements of Section 03 30 00 - Cast-In-Place Concrete for air entrained concrete.

C. Aggregate Base: In compliance with North Carolina Standard Specifications for Roads and Structures (NCSSRS), latest edition, Section 520.

D. Forms:

1. Wood or steel, straight, of sufficient strength to resist springing during depositing and consolidating concrete, and of a height equal to the full depth of the finished paving.

2. Wood forms shall be surfaced plank, 2" nominal thickness.

3. If of steel, forms shall be of approved section with a flat top surface.

E. Expansion Joint Filler: Material shall be asphalt-impregnated fiber strips 1/2" thick, equal to Celotex "Flexcell".

F. Abrasive Aggregate: Alundum (c.f.) aggregate, fine (1/32" to 1/4") as manufactured by Norton Company, Worcester, MA 01606.

G. Curing Compound: Liquid curing compound shall be Masterseal by Master Builders Inc., Clear Seal by A. C. Horn, Kure-N-Seal by Sonneborn, or approved equal, and shall comply with ASTM C 309, Type I.

H. Sealant: Provide as work of this Section and in accordance with Section 07 90 00.

PART 3: EXECUTION

3.1 SUBGRADE FOR WORK OF THIS SECTION:

A. Perform any grading necessary to bring subgrades, after final compaction, to required grades and sections for site improvements. Fill and compact traces of trenches resulting from underground work.

B. Remove spongy and otherwise unsuitable material and replace with approved material. Loosen exceptionally hard spots and recompact. Take every precaution to obtain a subgrade of uniform bearing power. When necessary, compact subgrade with a high-energy mechanical tamper. Compaction shall be a minimum of 95% of Standard Proctor to within 2' of final grade and 100% of Standard Proctor in the upper 2' in accordance with ASTM D 698.

3.2 AGGREGATE BASE:

A. Provide 6" of the specified aggregate base under all concrete paving to receive vehicular traffic. Unless shown on the Drawings, aggregate base is not required under sidewalks and other walkways to receive pedestrian traffic only.

3.3 FORM WORK:

A. Steps: Form steps with smooth plywood, oiled with non-staining oil, to produce smooth surfaces. Form to dimensions and profiles shown on Drawings.

B. Walks: Form to depths and sections shown on Drawings.

C. Forms shall be straight, true to plane, plumb and shall be braced to prevent displacement during concrete placing. Forms shall be tight to prevent leakage of concrete.

D. Provide expansion joints with premoulded filler, not more than 30' apart; also, at junction of concrete pavement and other materials, where pavement abuts buildings and elsewhere as shown.

E. Slope walks and paving as noted on Drawings or if not shown, as required to provide drainage and prevent ponding of water on walks and paving. Make slight adjustments in grades and cross slopes to connect with intersecting walks and to adapt work to drainage scheme.

3.4 REINFORCEMENT:

A. Reinforce concrete as shown on Drawings and as specified herein. All concrete paving and sidewalks are to be reinforced with woven wire mesh specified hereinbefore.

3.5 PLACING CONCRETE:

A. Preparation Before Placing:

1. Before concrete is placed, clean all mixing and transporting equipment and remove debris, ice, water and deleterious material from forms and reinforcement which would affect quality or appearance of concrete or inhibit bond of concrete to reinforcing.

2. Provide runways and access to areas to be placed which will protect forms and reinforcement from displacement.

3. Place concrete on a firm, dry subgrade. In no case place concrete on frozen subgrade.

B. Conveying: Convey concrete from mixer to place of final deposit by methods which will prevent separation or loss of materials. Equipment for conveying concrete shall be of such size and design as to insure a practically continuous flow of concrete from delivery end to point of deposit without separation of materials.

C. Depositing:

1. Do not mix or place concrete when atmospheric temperature is below 40^{o} F., nor when such temperatures are expected within 2 days unless cold weather procedures specified in Section 03 30 00 are followed.

2. Deposit concrete as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Maximum free fall of concrete shall be 3'.

3. Deposit concrete at a rate so that concrete is plastic at all times and is being integrated with concrete which is still plastic. Deposit continuously until concrete work between construction joints is complete.

4. Consolidate concrete thoroughly by suitable means during placement. Work thoroughly around reinforcement and embedded items and into corners of forms.

5. Spade concrete thoroughly along forms and expansion joints.

6. Where surface mortar is basis of finish of concrete, work coarse aggregate back from forms without formation of surface voids.

7. Vibrators may be used provided they are used by experienced operators and provided forms have been designed against deflection and displacement by vibrated concrete.

8. Tamp and screed concrete true to grade and section. Do not trowel concrete (after darbying) until surface water has evaporated.

9. Score walkways at 5'-0" on center unless shown otherwise on Drawings. Use edging tool with 1/4" radius to provide rounded corners at joints.

10. Expansion Joints: Provide joints with premolded joint filler wherever concrete abuts other rigid construction and vertical abutments. Unless shown otherwise on the Drawings, locate expansion joints at 30' o.c. for concrete paving in the field of the paving and also at 30' o.c. in walks.

3.6 SEALANTS: Seal all expansion joints in concrete pavement, both in the field of the pavement and where concrete pavement abuts vertical surfaces such as building walls and concrete island curbs. Top of joint fillers in expansion joints shall be kept approximately 1/2" below top surface of concrete. The specified sealant shall be installed from top of joint filler to flush with top surface of concrete. See Section 07 90 00 for material and installation requirements.

3.7 ABRASIVE AGGREGATE:

A. Soak aggregate in clear water and drain off surplus.

B. Sprinkle aggregate uniformly on concrete surface at the rate of 25 lbs. of aggregate per 100 sq. ft.

C. Tamp aggregate into concrete lightly with trowel.

D. Apply aggregate to full area of tread of steps.

3.8 REMOVAL OF FORMS:

A. Remove forms carefully. Do not damage face of concrete.

3.9 FINISHES:

A. Location:

1. Concrete Pavement to Receive Pedestrian or Vehicular Traffic: Light broom non-slip finish.

2. Exposed Surfaces Not Receiving Traffic: Steel trowel finish.

B. Light Broom Finish:

1. Bring to correct level with straight edge and strike off. Bring to a smooth surface (free of bumps and hollows) with bull-float or darby. Sprinkling dry cement, or mixture of dry cement and sand, will not be permitted. Do not work concrete further until water sheen has disappeared and/or mix has stiffened sufficiently so that the weight of a man leaves only slight imprint. Apply a fine broom finish at this time as final finish.

C. Steel Troweled Finish:

1. First step shall be same as for wood float finish. Delay troweling until after water and surface sheen have disappeared and concrete is hard enough to ring a steel trowel. Trowel and burnish concrete to a smooth, hard, dense wearing surface, free of trowel marks, hollows or other imperfections.

3.10 PROTECTION AND CURING:

A. All exposed surfaces of concrete shall be protected from premature drying by application of liquid curing compound specified hereinbefore. Freshly placed concrete shall be protected against wash by rain.

B. Curing Compound:

1. Concrete shall be cured by use of a chemical curing compound as specified herein. As soon as the newly finished concrete can be walked on, apply one coat of curing compound in strict accordance with manufacturer's printed instructions.

2. Do not cure surfaces with chemical compound which would inhibit bond of portland cement grout. Instead use wet burlap or equal wet cure method as specified in Section 03 30 00.

END OF SECTION 32 13 00